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Investigating the relationship between built environment infrastructure (sidewalks) and community physical activity and health in a small town in rural Iowa

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**Investigating the relationship between built environment infrastructure (sidewalks) and
community physical activity and health in a small town in rural Iowa**

by

Linda Elenore Johanson

A thesis submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Interdisciplinary Graduate Studies (Community Development)

Program of Study Committee:
Timothy Borich, Major Professor
Biswaranjan Das
Cornelia Flora

The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this thesis. The Graduate College will ensure this thesis is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University

Ames, Iowa

2019

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DEDICATION

To those I loved, my mother and father, Clara and John (Jack), and to my beloved son Christopher John and family.

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ABSTRACT

The major chronic diseases, cardiovascular disease (heart attack and stroke), diabetes, arthritis, and some cancers, are the leading cause of disability and death in the United States (U.S.). Overweight and obesity, highest in the U.S. South and Midwest, the location of this study, are the primary risk factors for the two most prevalent chronic diseases, type-2 diabetes and cardiovascular disease, which along with the other chronic diseases generate 75% to 85% of the nation's health care costs each year.

Studies have found people who engage in regular physical activity report reduced incidence of overweight and obesity and reduced incidence of chronic disease. For the current study, a random sample of adults living in residential neighborhoods in two adjacent voter prescient wards in a small town in rural Iowa completed a survey (n=162) to determine the impact place of residence had on diet and exercise. The two neighborhoods/wards, one with sidewalks and the other without sidewalks, had no statistically significant differences in demographic data regarding age, gender or income. Statistical analysis of survey data found place of residence, in a neighborhood with sidewalks or without sidewalks, was associated with residents' *favorite exercise* and *decision to exercise*. Of seven categories of favorite exercise, in the ward with sidewalks, 62.8% of survey respondents chose walking as their favorite exercise and 6.4% indicated they did nothing-no exercise. In the ward without sidewalks, 50.0% chose walking as their favorite exercise and 16.7% indicated they did nothing-no exercise. Current study results suggest sidewalks in residential neighborhoods in small towns in rural America might promote lifelong engagement in exercise which would improve health and lower healthcare costs of individuals living in the regions of the U.S. with the highest incidence of overweight and obesity.

CHAPTER 1. INTRODUCTION

Topic Background

Chronic disease, which is often preventable, is the leading cause of disability, death, and high health care costs in the United States. The major chronic diseases are cardiovascular disease (heart disease and stroke), diabetes, arthritis, and some cancers (Centers for Disease Control and Prevention [CDC], 2015; Ward, Schiller, & Goodman, 2014).

Two health concerns, overweight and obesity, are the primary risk factors for type 2 diabetes and cardiovascular disease which along with other chronic diseases generate 75% to 85% of the nation's health care costs each year (CDC, 2015; U.S. Department of Health & Human Services [HHS], 2003). In 2008, the estimated annual medical cost of obesity and related disease in the United States was \$147 billion dollars (CDC, 2019).

Overweight and obesity are often defined using an adipose tissue (body fat) measure referred to as body mass index (BMI). Using the BMI measure, overweight in adults is reported as a BMI of 25 to 29.9, and obesity in adults is reported as a BMI of 30 or over. The BMI is a straightforward, simple measure calculated solely on height and weight, giving a simple estimate of how much adipose tissue, i.e. body fat, an individual has (National Heart, Lung, and Blood Institute [NHLBI], 1998). The highest rates of obesity, BMI of 30 or over, in the United States are found in seven states in the South and Midwest. In those seven states (Alabama, Arkansas, Louisiana, Iowa, Mississippi, Oklahoma, and West Virginia), 35% or more of the adults are reported as obese (CDC, 2019).

Research indicates excessive weight gain leading to overweight, obesity, and chronic disease generally occurs after years of consuming a low-quality diet and living a sedentary lifestyle. The cumulative negative effects of life-long poor eating habits and little regular

exercise intensify as people reach age fifty and costly chronic disease begins to manifest. Consequently, Medicare and Medicaid finance approximately half of the cost of chronic disease in the United States, with Medicare covering the larger share. Additionally, the general population of the United States is getting older, and new immigrants coming into the country are increasingly representing an older demographic with multiple health issues (Lopez & Radford, 2017). As the prevalence of overweight and obesity continue to increase in the aging population and the prevalence of chronic disease and associated health care costs continue to increase, the combined effects threaten to eventually completely overwhelm the Medicaid and Medicare systems (Flegal, Carroll, Ogdon & Curtis, 2010; Kaiser Family Foundation, 2015; Stanton & Rutherford, 2006). Thus, as the United States ages and health care expenditures continue to increase, it is imperative to focus research on strategies that reduce or prevent the occurrence of chronic disease, especially in those seven states in the South and Midwest (Alabama, Arkansas, Louisiana, Iowa, Mississippi, Oklahoma, and West Virginia) where obesity is most prevalent (CDC, 2019).

An excellent way for community development to encourage regular physical activity among sedentary individuals is to promote walking in outdoors settings (Duvall, 2011; Focht, 2009). Outdoor walking in accessible residential neighborhoods can be encouraged by attributes of the community built environment (Sallis, & Glanz, 2006). The built environment, the neighborhood roads, buildings, and recreational facilities, can promote multiple types of physical activity by providing easy access to safe sidewalks, bike paths, hiking trails, swimming, and campgrounds for everyone, children as well as adults (Flora & Gillespie, 2009). Specifically, regarding children, Fulton, Shisler, Yore and Caspersen (2005) found the presence of safe

neighborhood sidewalks was the primary characteristic associated with increased physical activity and better health in children.

Background Interest of Investigator

My interest in the residential neighborhood built environment and its effects on community physical activity and health is rooted in a family health crisis of several decades ago. Late in the fall of 1994, my elderly mother, living in a small town in rural, west central Iowa, was rushed to a hospital after suffering the first of two devastating strokes, both caused by a chronic disease, type-2 diabetes. Along with witnessing the physiological impact of my mother's chronic disease I soon realized another devastating impact, the incredible financial costs associated with disabling, but often preventable, chronic disease. I witnessed my mother's overall health decline and her financial investments dwindle as she paid for seven years of in-home care that was required as a result of strokes caused by her chronic disease. Over the course of my mother's seven-year illness, her out-of-pocket medically related expenses not paid by her medical insurance were around \$230,000. As is the case for many middle-class Americans, the direct and indirect costs of my mother's chronic disease eventually depleted all her savings and retirement accounts while destroying her ability to enjoy active involvement in community life.

From the time of my mother's initial stroke in 1994 to her death in 2001, I explored the causes of chronic disease. I talked with health care professionals in my mother's community and read recommended medical books and articles in medical journals. I learned medical research had found chronic disease was often a direct result of an inactive lifestyle which could be a consequence of individual lifestyle choices or the result of community residential neighborhood design that restricts activity. During the time of my mother's illness, due to my "research" and query I began to understand and define individual physical inactivity and resultant chronic

disease as a community concern that needed to be addressed at the community level, not just the individual level.

Since the 1970s, many communities in Iowa permitted residential neighborhoods to be constructed with few or no sidewalks, completely restricting easy access to the simplest, most prescribed exercise, walking (HHS, 2015). However, the presence or absence of residential neighborhood sidewalks is a community built environment issue, and often a zoning issue, which the individual generally does not directly control. I realized communities and community planners, not just individuals, needed to address the causes of chronic disease, primarily physical inactivity, and the possible preventive measures.

Years later, I entered a Family Financial Planning master's degree program, and discovered it was relatively easy to prepare a portfolio of investments that would financially prepare middle class individuals for a secure retirement. However, it was nearly impossible to prepare a portfolio of investments that would financially prepare those same middle-class individuals for a secure retirement AND cover potential high medical costs that accompany chronic disease. I concluded that preventing chronic disease was a far better strategy than trying to determine ways to finance its costs. Subsequently, after receiving a Family Financial Planning master's degree in 2011, to inform future community planners, I entered the Interdisciplinary Graduates Studies master's degree program with a specialization in Community Development. My goal was to further investigate links between the residential built environment, physical activity and chronic disease, and attempt to identify the community residential built environment features that promote physical activity and healthy lifestyles, ultimately reducing occurrence of chronic disease.

Purpose of the Study

The purpose of this study was to investigate whether availability of sidewalks in residential neighborhoods was associated with residents engaging in regular physical activity and reporting good to excellent health. The study is important because it was conducted in a small town in Iowa, one of seven states in the United States with the highest rate of obesity (CDC, 2019). The study fills a gap in previous research regarding the built environment's effects on health and wellness in rural communities by employing a natural experiment to compare the effects of built environment differences on physical activity and perceived health status in two adjacent residential neighborhoods, one neighborhood had sidewalks and the other did not. The **general theory** guiding this study was *physical activity promotes healthy lifestyles*.

Research Question and Sub Questions

The **research question** that drove the study was *How can community development initiatives promote rural, residential built environments that help combat obesity?* The research sub questions for this study were formulated with intent of finding whether an element of the residential built environment (sidewalks) promotes healthy lifestyles.

The survey-based research presented in this paper answers the following **research sub questions**: Do sidewalks in residential neighborhoods encourage physical activity/exercise by adult residents of the neighborhood? Do adults living in residential neighborhoods with sidewalks record more hours of exercise per week than adults living in residential neighborhoods without sidewalks? Do adults living in residential neighborhoods with sidewalks indicate better health than adults living in residential neighborhoods without sidewalks? And Do adults living in residential neighborhoods with sidewalks consume healthier foods than adults living in neighborhoods without sidewalks?

Goals and Objectives

The long-term goal of this study is to further the community development process in which collective actions of community residents generate solutions to obesity in rural communities. The implication of this study is if sidewalks in residential neighborhoods in rural communities are associated with regular exercise and self-perceived good to excellent health, then community initiatives promoting sidewalks in all residential neighborhoods in rural communities could result in improved overall health and lowered health care costs of rural individuals, ultimately increasing the human capital, financial capital and the other capitals/investments in rural communities.

Thesis Organization

This thesis, which includes a survey and data analysis, begins with an introduction, followed by a review of literature regarding chronic disease and prevention, physical activity/exercise, the built environment, community development and the community capitals framework, geographic information systems, and the legal framework. The methodology of the survey is presented next, followed by results of the survey, discussion, and recommendations for future research.

CHAPTER 2. REVIEW OF LITERATURE

This literature review establishes the state of knowledge in the fields that inform the issues that are the focus of the survey-based study presented in this paper. This study assessed the relationship between survey participant's engagement in regular exercise and self-perceived health status to the presence or absence of sidewalks in two residential, working class neighborhoods in two adjacent voter precinct wards in Forest City, a small town in rural, north central Iowa. The literature review provides background information regarding chronic disease and its primary cause, overweight and obesity, as well as research findings regarding how built environment infrastructure (sidewalks) may play a role in promoting physical activity and reducing or preventing overweight and obesity, the community development process, geographic information systems, and the legal framework.

Chronic Disease

Chronic disease is defined as disease that persists for longer than three months. The major chronic diseases are cardiovascular disease (heart disease and stroke), diabetes, some cancers, and arthritis. As of 2012, over half of American adults had at least one chronic disease, and almost one of three American adults had multiple chronic diseases (CDC, 2015).

Nearly all the chronic diseases, often the result of an unhealthy, modifiable lifestyle, are preventable (HHS, 2003; Koop, Pearson, & Schwarz, 2001; McGinnis, Williams-Russo, & Knickman, 2002). None-the-less, chronic disease remains the leading cause of disability and death in the U.S. with seven of ten deaths each year attributed to chronic disease, resulting in enormous direct and indirect medical costs and emotional suffering. Two health concerns, overweight and obesity, are the primary risk factors for chronic disease (CDC, 2015; Ward, Schiller, & Goodman, 2014).

Overweight and Obesity

Overweight and obesity are often diagnosed using a body mass index (BMI) measure. The BMI is a straightforward, simple measure of the presence of body fat calculated using the height and weight of an individual. The measure does not consider the gender of the individual, the proportion of fat and muscle, or different body shapes. Using the BMI measure, overweight in adults is reported as a BMI of 25 to 29.9, and obesity in adults is reported as a BMI of 30 or over. Because of the simplicity of the BMI measure, in some instances an individual, such as a body builder, will have a BMI that indicates they are obese when they are not. This is due to muscle weighing more than fat (NHLBI, 1998). Due to potential inaccurate diagnosis, Tomiyama, Hunger, Nguyen-Cuu, & Wells (2016) suggest caution in the use of the BMI as a general measure of obesity for all populations. Mayo Clinic Staff (2019) advises using the BMI along with other measures of body fat percentage, simple observation, waistline measure, blood tests, and so on, especially if the population is young or taking part in certain athletic activities. Notwithstanding its shortcomings, the BMI measure continues to be a simple, quick measure of obesity that is used without concern in most areas of the U.S., where the median age is thirty five to forty years and adult residents are generally not highly involved in athletic activities (Gallagher et al., 1996).

In the U.S., the prevalence of overweight and obesity doubled from 1980 to the year 2000 (Flegal, Carroll, Ogden, & Johnson, 2002). By 2010, more than one-third of U.S. adults were beyond the overweight classification, they were obese, and nearly one of five youths between the ages of two and nineteen years were obese (CDC, 2014). Due to the ever-increasing prevalence of obesity, public health officials now refer to obesity as an epidemic. All regions of the U.S. report more than 25% of their residents are obese, with some regions reporting far greater rates than others. Obesity among adults in the West is reported as 26.1%, in the Northeast as 27.7%, in

the Midwest as 32.3%, and in the South 32.4% of adults are reported as obese. In seven states located within the Midwest and South (Alabama, Arkansas, Iowa, Louisiana, Mississippi, Oklahoma, and West Virginia), over 35% of the adults are obese (CDC, 2019).

The reasons for weight gain and obesity are varied, with multiple causes and no simple solutions. While there are some genetic determinants of obesity, most of the recent increases in the prevalence of obesity in the U.S. are the result of low levels of physical activity and unhealthy food choices. Generally, simple weight gain is a result of an imbalance between the number of calories consumed and the number of calories expended by an individual. In other words, an individual will gain weight if more calories, widely available in calorie dense junk foods, are consumed than expended in daily activities. Increased consumption of high calorie, unhealthy foods may reflect ever increasing availability of multiple types of pre-packaged foods, low-cost-big-portion restaurant meals, and soft drinks, all of which may be high in sugar and calories (Barnes & Schoenborn, 2003; Koop et al., 2001; Mokdad et al., 2001).

Cost

The direct health care costs of overweight and obesity represent a significant, ever-increasing portion of total annual U.S. health care expenditures. In 2008, medical costs directly linked to obesity were estimated to be \$147 billion (Finkelstein, Trogon, Cohen, & Dietz, 2009). In 2010, the total costs of heart disease and stroke, often due to obesity, was estimated to be \$315.4 billion. Of this amount, \$193.4 billion was for direct medical costs, not including costs of nursing home care (Go et al., 2014). In 2012, the total estimated cost of diagnosed diabetes was \$245 billion, including \$176 billion in direct medical costs and \$69 billion in decreased productivity associated with being absent or less productive at work. The \$245 billion estimated cost of diabetes in 2012 represented a 41% increase from 2007 (American Diabetes Association, 2018). By 2013, health care costs for people with diabetes and cardiovascular diseases and the

other major chronic diseases accounted for 86% of the nation's medical care costs (CDC, 2015; Gerteis et al., 2014). Regarding individuals, in one 2-year period, 1996 and 1998, there was a 15% increase in annual per capita Medicare spending attributable to health costs due to medical issues resulting from being overweight, and a 37% increase in annual per capita Medicare spending attributed to health costs due to medical issues resulting from being obese (HHS, 2003; Stanton & Rutherford, 2006). Population health care cost data indicates per capita health care costs skyrocket with increasing age (Reaves & Musumeci, 2015).

Age

The major chronic diseases begin to “kick in” and do their most damage as people reach age fifty and the cumulative effects of life-long poor eating habits and little regular exercise begin to show their effects (Kaiser Family Foundation, 2015). Obese people who reach sixty-five years of age have much larger annual Medicare expenditures than non-obese people. Consequently, Medicare and Medicaid finance as much as half of the costs of chronic disease associated with overweight and obesity, with Medicare covering the larger share of the costs.

As the population of the United States ages over the next several decades and the prevalence of overweight and obesity in elders continue to increase, the prevalence of chronic disease and related health care costs will increase dramatically and further burden the Medicare and Medicaid systems (Flegal et al., 2010; Kaiser Family Foundation, 2015; Stanton & Rutherford, 2006). The increases in the nation's health care costs for overweight or obese elderly individuals are exacerbated by the ever-increasing elderly population. By 2050, the number of Americans, including new immigrants, in the highest health care cost category, age sixty-five and older, is projected to represent 20% of the U.S. population. That will almost double the population over age sixty-five in 2010 (Lopez & Radford, 2017; Vincent & Velkoff, 2010), and it is projected that the vast majority of those over sixty five, almost 85%, will have at least one

very expensive, chronic health condition. Additionally, a concern for all communities is the continually increasing percent of the residents over fifty years old, many still in the workforce, will create escalating health care costs and increasing insurance costs for individuals and local employers (Kaiser Family Foundation, 2015; Manson & Bassuk, 2003; Stanton & Rutherford, 2006).

Despite the health risks and health care costs associated with elder obesity, controversy exists regarding the treatment of obesity in older individuals (Houston, Nicklas, & Zizzal, 2009; Miller & Wolfe, 2008). Older adults who are obese and often inactive, are particularly susceptible to sarcopenia, defined as loss of skeletal muscle. Sarcopenia, usually a combination of muscle loss and fat gain, increases risk for functional decline, physical disability, and increased healthcare costs (Baumgartner, 2006; Blaum, Xue, Michelon, Semba, & Fried, 2005; Santilli, Bernetti, Mangone, & Paoloni, 2014).

Researchers have found physical activity that preserved muscle mass is of paramount importance in weight loss programs for elders. In the aging U.S. population, weight loss may improve mobility of obese elders by reducing the load placed on the musculoskeletal system, but weight loss can accelerate the rate of muscle loss that normally occurs with aging unless the weight loss occurs while participating in appropriate physical activity (Baumgartner, 2006; Blaum et al., 2005; Cesari et al., 2005). Several studies involving obese elders found that lifestyle-based weight loss programs that include exercise and dietary change produced significant weight loss, improved physical function, with no muscle mass loss (Anton et al., 2011; Espeland et al., 2007), but most elders do not have access to controlled exercise and dietary change programs. Therefore, because of the difficulty in addressing obesity in the elderly

and because expensive, chronic disease is often a consequence of obesity, it is best to implement prevention strategies at an earlier age.

Prevention Makes Sense

The risk factors for chronic disease are linked to life-long health damaging behaviors, primarily inadequate regular physical activity and poor eating habits, which result in overweight and obesity, the primary triggers of chronic disease. Therefore, as Americans age and health care expenditures continue to increase, it is important to focus on strategies that reduce the prevalence and cost of often preventable, always costly chronic diseases. Just as most chronic diseases are caused or made worse by the same risk factors, inadequate regular physical activity and poor eating habits, they can be prevented or lessened by the same strategies and interventions that reduce those risk factors. The major risk factors for chronic disease, inadequate regular physical activity and poor eating habits, can and must be addressed at two levels, the individual level and the population level, including policies and environments that promote health (CDC, 2015).

To optimize public health's efficiency and effectiveness at both individual level and population level, the CDC (2015) recommends coordinating chronic disease prevention efforts in four key domains: epidemiology and surveillance to monitor trends and track progress; environmental approaches to promote health and support healthy behaviors; health care system interventions to improve the delivery and use of clinical and other high-value preventive services; and community programs linked to clinical services to improve and sustain management of chronic conditions.

The following quote by Tommy G. Thompson, then-Secretary, Department of Health and Human Services, National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], (2001) sums up the influence exercise and maintaining a healthy lifestyle has on prevention of all the costly chronic diseases, "So many of our health problems can be avoided

through diet, exercise and making sure we take care of ourselves. By promoting healthy lifestyles, we can improve the quality of life for all Americans and reduce health care costs dramatically.”

The key point is prevention. The major chronic diseases are often totally preventable. The lifelong unhealthy behaviors that result in chronic disease have cumulative effects. Thus, a healthy lifestyle that includes a healthy diet and adequate physical activity must be a part of life from the cradle to the grave.

Physical Activity

Ironically, increases in obesity have occurred even though the public has become more educated regarding what constitutes a healthy diet and healthy portion size, and all ingredients in food products have become clearly identified on labels. This suggests more emphasis is needed on the other major cause of obesity, lack of enough daily physical activity/exercise (Barnes & Schoenborn, 2003; Mokdad et al., 2001). According to the CDC (2015), “Even though lack of physical activity/exercise is a primary risk factor contributing to the major chronic diseases, in 2011, more than half (52%) of adults aged eighteen years or older did not meet recommendations for daily aerobic exercise or physical activity.” This is unfortunate because walking, the easiest form of exercise, is an action most people can perform if there are readily accessible locations for walking near where they live.

Walking

Walking is a basic human behavior that is an excellent way to achieve the recommended amount of daily physical activity (Murtagh, Murphy, & Boone-Heinonen, 2010). It is an activity that most people can engage in, regardless of age or fitness level. Murtagh et al. (2010) found walking had a key role in the prevention of cardiovascular disease, producing all around health benefits for populations of all ages, male and female. They found that walking was an especially

promising strategy for improving the health of the obese and sedentary populations who are less likely to perform vigorous physical activity of any kind.

Tudor-Locke (2012) refers to walking as preventive medicine, stating, “Walking is uncomplicated - most of us have long since mastered this simple motor pattern. It requires no special talents or equipment. It is inexpensive, safe, feasible, accessible, convenient, and practical.” Importantly, walking is enormously effective in promoting good health. Walking remains one of the primary examples of health-related physical activity extolled by public health guidelines worldwide. Walking helps prevent weight gain and a number of the chronic health conditions, diabetes, cardiovascular disease, and some cancers, that are associated with unhealthy lifestyles (Albright & Thompson, 2006; Caspersen & Fulton, 2008; Gordon-Larsen et al., 2008; Magne et al., 2011; O'Donovan et al., 2010; Paterson & Warburton, 2010; T. Smith, Wingard, B. Smith, Kritz-Silverstein, & Barrett-Connor, 2007). Walking prevents functional losses and age-related disability and lengthens life (Hamer & Chida, 2008). In general, walking as a mode of transportation or for fitness contributes to a heightened quality of life (van Uffelen, Chin A Paw, Hopman-Rock, & van Mechelen, 2007).

Physical activity such as walking can help improve health, for example, lowering blood pressure, even without weight loss (CDC, 2012). Worksite health promotion programs that involved walking have shown positive effects on health status, decreased health care doctor visits, and decreased work absenteeism even when there was no weight loss. Haines et al. (2007) investigated the effect of a worksite pilot program, a college faculty and staff Virtual Walking and Wellness Program, that used treadmills to promote walking and wellness in order to improve the health of college faculty and staff. They found virtual walking (treadmills) did not always

produce weight loss but was associated with diet improvements and increased involvement in other community physical activities.

Outdoor Walking

Many studies have found that walking is one of the best forms of exercise for all ages, but not all studies have investigated the differences between the benefits of indoor and outdoor walking. A study by Focht (2009) did investigate that difference. The purpose of the Focht study was to compare the effects of brief walks performed indoors and outdoors on affective responses, enjoyment, and future intentions to walk for exercise. Both indoor and outdoor walks resulted in improvements in affective responses, but participants reported greater enjoyment and intention for future participation after outdoor walking. In addition, physical exhaustion during outdoor walking correlated with intention for future participation. These findings suggest that outdoor environments positively influence the affective responses to brief walks and positively influence the intent to continue walking in the future. In other words, the findings suggest a desire to continue walking when walking is done outdoors, even if the individual becomes physically exhausted from the walk. The same was not true of walking indoors on an indoor track or treadmill (Focht, 2009).

Being physically active in natural environments has been associated with improvements in not only physical health but also mental well-being (Duvall, 2011). Contact with nature appears to have many benefits, even when that contact is limited. For example, exposure to urban nature promotes pleasant moods and natural images promote prosocial aspirations (Nisbet, Zelenski, & Murphy, 2010). Nature may also restore self-control. Research data suggests some individuals experience reduced criminal intent and aggression after being in nature or a natural setting (Berman, Jonides, & Kaplan, 2008; Kaplan & Berman, 2010; Kuo & Sullivan, 2001a; Kuo & Sullivan, 2001b; Weinstein, Przybylski, & Ryan., 2009). Moreover, nature appears

beneficial to human health for individuals of all incomes, potentially reducing the mortality risk associated with income inequalities (Mitchell & Popham, 2008). These effects are explained by Wilson's (1984) biophilia hypothesis, the idea that because humans lived in natural settings until recently means there is likely an innate need to affiliate with other forms of life found in nature. Therefore, spending time in nature fulfills this need and promotes well-being, whereas nature deprivation may contribute to maladaptive functioning (Kellert, 2003).

Walking, especially walking in an outdoor setting which has been found to have positive physical and psychological benefits, is an excellent way to encourage regular physical exercise among sedentary individuals. When individuals are outdoors, presence of street lighting, neighborhood cleanliness, and the aesthetic qualities of the environment have all been shown to be associated with increased levels of physical activity (Addy et al., 2004; Duncan & Mummery, 2005; Humpel, Owen, & Leslie, 2002; King et al., 2000). In general, if there is adequate infrastructure providing a safe place to walk, outdoor walking is an excellent form of physical activity that can be done by rich or poor in order to promote good health (Bravata et al., 2007; Myers, 2003; Yusuf, Reddy, Ounpuu, & Anand, 2001).

Duvall (2011) found that settings which are most effective in supporting outdoor physical activities such as biking or walking typically possess several specific environmental attributes such as easy access to sidewalks and trails. A study by Hijikata and Yamada (2011) found walking at a brisk speed for thirty minutes as soon as possible just after lunch and dinner leads to more weight loss than does walking for thirty minutes beginning one hour after a meal has been consumed. The author of the study lost nearly 3 kg of weight and a volunteer participant lost nearly 1.5 kg of weight during one month of walking just after lunch and dinner. The author walked at a brisk pace, while the volunteer walked at a stroll. They repeated the preliminary

experiment twice and obtained the same results. However, the ability to engage in walking, at a brisk or slow pace, directly after a meal necessitates close access to a sidewalk or walking trail.

Deterrents to Physical Activity

Mokdad et al. (2001) studied adults who were trying to lose weight, or not-gain weight, and found that less than 20% of the individuals were following recommendations regarding increasing physical activity and reducing calories. A study by the National Center for Health Statistics (NCHS) found less than a third of US adults engaged in regular leisure-time physical activity, and only about one-fifth of adults engaged in a high level of overall physical activity. Recommendations to increase physical activity and reduce calorie intake may not be easy to follow by many individuals due to environmental influences that may jeopardize their efforts (Barnes & Schoenborn, 2003).

Socioeconomic status (SES) and the built environment

Eyler, Brownson, Bacak, & Housemann (2003) found that regular walkers were most often white, with a college degree, between the ages of thirty to forty-four years, and often live in walkable neighborhoods. Residents of walkable neighborhoods usually also have good access to recreational facilities and are more likely to be physically active and less likely to be overweight or obese than residents of low-income, unwalkable neighborhoods (Ball et al., 2007).

Disparities in environments and policies that disadvantage low-income communities and racial minorities have been well documented (Sallis & Glanz, 2009). Not all neighborhoods or environments provide the same opportunities to engage in walking for transportation, exercise, or recreational purposes. Individuals living in low-income and racial/ethnic minority communities experience disproportionately less access to environments that support physical activity than individuals in higher income communities. This disproportionate access is generally associated

with the disparities in exercise and obesity rate differences between high-income and low-income neighborhoods (Kelly, Schootman, Baker, Barnidge, & Lemes, 2007).

Findings of Kelly et al. (2007) suggest that efforts to address physical inactivity in lower income communities must address the inequality in environmental access to opportunities to be physically active. The low-income demographic, with its high rate of obesity, are most in need of access to neighborhood walking and exercise opportunities. Among older adults, African American women, who are often low income, have the highest prevalence of obesity in the U.S., with over half classified as obese (Hedley et al., 2004) and have disproportionately higher rates of weight-related comorbidities than do other older adult populations (Jones & Sutton, 2008). Consequently, older African American women represent a particularly high-risk population who would benefit most from living in walkable neighborhoods. Eyler et al. (2003) suggest public health strategies aimed at promoting walking for exercise or enjoyment among low socioeconomic (SES) groups might focus on urban planning strategies to build more walkable neighborhoods by improving access to sidewalks and greater connectivity among streets in the disadvantaged areas. There are other location factors that need to be taken into consideration. Studies of rural adults, especially the rural poor, show they have a higher prevalence of obesity and inactivity than urban adults. Consequently, the rural neighborhood environments have been generally thought to be related to rural obesity, although rural obesity has not yet been proven to be true though research (Joshua, Boehmer, Brownson & Ewing, 2008). There may be other factors affecting research results.

Obesity paradox

Research studies without controls for SES and related factors (low quality food and illegal drug use) might have introduced confounding variables into research studies regarding exercise. Past research that ignored SES and related factors (low quality food and illegal drug

use) found low income individuals who were obese experienced obesity related health issues which needed treatment, but still had better health outcomes than those who were not obese. Those research results reduced the importance of exercise, raised the importance of diet, and contributed to the obesity paradox, a medical hypothesis which states obesity may, counterintuitively, lead to better health outcomes for some groups of people (Hainer & Aldhoon-Hainerova, 2013). Because of the inconsistent correlation between increased exercise and lowered rates of obesity, health care professionals have often emphasized improved diet as the primary “prescription” for obesity, especially for low income individuals, while putting slightly less emphasis on exercise. Consequently, a primary focus on diet improvement without an equal emphasis on exercise could be a contributing factor in the ever-increasing prevalence of obesity especially for low income individuals. As a study by Sallis and Glanz (2006) indicates, improvements in the quality of food available at an affordable price would likely contribute to at least some reduction in obesity rates among the poor, but the presence of walkable sidewalks which promote walking would likely be necessary to improve overall health of residents of poor neighborhoods.

Time

Brownson, Baker, Housemann, Brennan, & Bacak (2001) found the four most commonly reported personal barriers to structured physical activity/exercise were lack of time, feeling too tired, obtaining enough exercise at one's job, and no motivation to exercise. Some of those barriers may be related to SES factors and long work hours in low paying, labor intensive occupations. However, Spinney and Millward (2010) found that of the four, lack of time may be the most important barrier to regular physical activity no matter the income level of the individual. Barnes and Schoeborn (2003) found individuals who want to be more physically active may not have time to exercise due to ever increasing demands and other constraints

associated with their work, family, and community. Frank, Engelke, & Schmid (2003) suggested that it would be beneficial to focus public health programming towards utilitarian forms of exercise such as walking for transportation which people can naturally engage in instead of organized recreational forms of exercise such as community sports programs that take more of the individual's time than simply walking. Regarding time, Jenkins and Osberg (2004) state, "It has long been acknowledged that one reason why gross domestic product (GDP) per capita is a poor measure of economic well-being is because it does not recognize the opportunity cost in lost leisure time to individuals to increases in average monetary income which stem from longer average work hours." Ultimately, if time is a primary barrier to physical activity, then access to engagement in physical activity must be convenient and close at hand, as is the case in walkable communities.

Built Environment

Loosely defined, the built environment consists of the neighborhoods, roads, buildings, food sources, and recreational facilities in which people live, work, are educated, eat, and play (Sallis & Glanz, 2006). Characteristics of the built environment affect the health of communities due to how the built environment promotes or discourages physical activity (Diez Roux, 2003; Evans, 2003; Handy, Boarnet, Ewing, & Killingsworth, 2002; Savitch, 2003). Quality of the physical environment matters when it comes to people's decisions to walk and engage in other types of physical activity (Boarnet, Forsyth, Day, & Oakes, 2011). Sallis and Glanz (2009) summarized and synthesized representative studies regarding the relationship of the built environment, physical activity, and food options to obesity. In general, the studies found residents of walkable neighborhoods who have easy access to recreational facilities and healthy food options are more likely to be physically active and less likely to be overweight or obese than counterparts in unwalkable neighborhoods.

The built environment can promote physical activity and contribute to a reduction in obesity by providing safe sidewalks, bike paths, trails, safe swimming places, and campgrounds (Flora & Gillespie, 2009). Li, Fisher, Brownson, and Bosworth (2005) investigated the environmental influence on walking activity by examining select built environment factors such as accessibility, proximity to recreational opportunities, and residential and commercial density. Their findings show that neighborhoods with high level density of places of employment, high level household density, greater numbers of street intersections, and green and open spaces for recreation were associated with more frequent walking activity. At the residential level, Li et al. (2005) found that residents' perceptions of proximity to recreational facilities and safety for walking in their neighborhood were significantly related to neighborhood walking for transportation and exercise. Handy, Cao, and Mokhtarian (2008) report that improving physical aesthetic qualities and social environment may increase physical activity in residential neighborhoods. Their cross-sectional and quasi-longitudinal analyses provides evidence of a causal impact of neighborhood design on neighborhood physical activity, including both walking for exercise and leisure.

Many older adults in urban areas are sedentary due to the lack of good infrastructure in the public areas in their communities (Leung et al., 2014). This is especially troubling because older adults are the most likely to benefit from participation in neighborhood physical activities such as walking. Nathan, Wood, and Giles-Corti (2014) found that positive perceptions of the built environment within retirement villages, and in the neighborhood surrounding retirement villages, were related to walking among residents of the villages.

Sidewalks

Walking is a perfect exercise for most individuals. It is an activity that does not require special skills or equipment and can be performed within one's neighborhood if there is

appropriate infrastructure. Communities with accessible, maintained sidewalks and biking paths promote daily physical activity which lowers the health risks that are often the byproducts of a sedentary lifestyle (Gorelick et al., 1999; Wannamethee, Shaper, Walker, & Ebrahim, 1998). Built environment research provides evidence of neighborhood design features that can impede or support neighborhood activity, including walking. For example, people walk more in communities that have sidewalks in good condition with few obstructions, provide destinations and facilities that can be reached within walking distance, and are free from physical disorder such as trash, litter, and abandoned buildings (Kelly et al., 2007).

According to Eyler et al. (2003), neighborhood streets with sidewalks appear to promote walking for physical activity by both regular and occasional walkers. In contrast, sedentary individuals who never walked were more likely to report no sidewalks and poor lighting in their neighborhoods as reasons for not walking. Brownson et al. (2001) similarly found the presence of sidewalks and enjoyable scenery was positively associated with various type of outdoor physical activity, including walking. Regarding children and physical exercise, Fulton et al. (2005) found the presence of neighborhood sidewalks was the main characteristic associated with increased physical activity in children. In a cross-sectional analysis, Fulton et al. (2005) report neighborhood sidewalks in a child's environment promoted active transportation to school (ATS), by walking or biking.

Researchers will probably not find a single “smoking gun” when looking for a link between the environment and obesity in children. It is more likely many built environment variables will show a strong cumulative effect on diet, physical activity, and body weight in children and no single variable will have a dominant influence (Sallis & Glanz, 2006). None-the-less, certain community, built environment patterns such as a lack of sidewalks, long distances to

schools, and the need to cross busy streets, all discourage walking and biking to school. Generally, eliminating environmental barriers increases rates of active commuting. Well maintained walking routes in neighborhoods encourage people, children and adults, to walk to schools, bus stops, trains, and trolleys (CDC, 2012; Sallis & Glanz, 2006).

Walkability

The walkability of a community is defined by the extent to which characteristics of the built environment and land use may or may not be conducive to residents walking for either leisure or exercise to access services or to travel to work (Leslie et al., 2007). Walkability entails the opportunity for continuous movement across some distance and therefore engages both the local and global street networks with well-connected streets that provide more direct walking routes (Zook, Lu, Glanz, & Zimring, 2011). Walkability of a neighborhood measures whether a community's design encourages or inhibits walking. For example, lack of sidewalks along streets can make walking unsafe and disconnected street networks can discourage walking (Marshall, Brauer, & Frank., 2009). Conversely, high walkability is associated with good local and global street networks, mixed land use where residences are intermixed with businesses or recreation areas, proximity to retail shops and restaurants, and high housing density (Murtagh et al., 2010).

In all age populations, the impact of the built environment upon walking has shown increased walking behavior in highly walkable neighborhoods (Sundquist et al., 2011). The level of walking, cycling, and outdoor recreational activity is strongly affected by accessibility to local facilities (Barton, 2009). In walkable neighborhoods, individuals often use walking for transportation. They walk to a location such as a workplace, a school, or a shopping destination (Owen et al., 2007). As noted by Zook et al. (2012), "If increased physical activity, including walking for health is the goal, then increased attention should be paid to local-to-global path conditions and continuity of pedestrian paths. Extension of a limited number of continuously safe

and comfortable paths that do not require multiple direction changes to access the greater street network may satisfy pedestrianism needs without overrunning adjacent neighborhoods with through-traffic.”

Whether considering children or adults, any effort to enhance health and wellness must consider the built environment. The way the built environment is created can affect whether people walk, bike, or ride in a car to daily destinations, eat frequently at fast-food restaurants, or walk to parks for leisure activities. Generally, individuals who live in walkable communities are more physically active and less likely to be overweight than those who do not live in walkable communities (Sallis & Glanz, 2006).

Sense of Community

Research has revealed a relationship between walking, walkability, and sense of community and enhanced well-being. Lund (2002) found the frequency of walking within neighborhoods was associated with more unplanned interactions with neighbors which contributed to relationship formation and development. Also, people who perceived their neighborhood environment to be safe expressed more of a sense of community. They were more likely to walk and move about more when they felt protected from traffic and safe from crime and hazards (CDC, 2012). Conversely, the presence of vehicular traffic and car parking negatively affected perceptions of neighborhood friendliness and safety (Mullen, 2003). Therefore, pedestrian-friendly environments that encourage local walking may be important in promoting neighborhood interaction and sense of community as well as promoting good health (Wood et al., 2010).

Community designers have begun to emphasize the enhancement of sense of place and sense of community in neighborhoods through ecological designs that accommodate interaction of residents with one another and the environment. Spending more time in the community results

in a higher likelihood of creating and maintaining connections with the people in the neighborhood, and as a result, neighborhoods with ecological design are likely to also have greater sense of community than more typically designed suburban neighborhoods (Rogers & Sukolratanametee, 2009).

Feelings of ties with one's neighborhood and fellow residents have been linked to a range of community level outcomes that positively influence well-being (McMillan & Chavis, 1986). These outcomes directly and indirectly influence health by providing social support, increasing social networks, and helping to build ties to the community. Of particular relevance to sense of community is the strong positive associations that develop with neighbors when walking outdoors (Ball et al., 2007; Berkman, 2001; Berkman, Glass, Brissette, & Seeman, 2000; Wood et al., 2010). However, sense of community is found to be associated only with leisure walking on sidewalks, not brisk walking on sidewalks or special walking trails. When engaged in brisk walking, individuals often don't stop to mingle and talk with others. Thus, the distinction between leisurely and brisk walking and the relationship of each with sense of community is important. Walking as a form of physical activity is often measured without making that important distinction (Owen, Humpel, Leslie, Bauman, & Sallis, 2004).

Although there needs to be a distinction made between walking for leisure and brick walking for exercise in the same neighborhood, the two are not dichotomous regarding enhancing communities. There are multiple avenues to sense of community through enhancing individual health and developing social bonds within a community, all elements of community development.

Community Development

“Community development is a process where community members come together to take collective action and generate solutions to common problems within their community.” Through

collective action at the grassroots level, community members are able to organize and plan together, develop healthy lifestyle options, empower themselves, create employment and economic opportunities, and achieve social, economic, cultural and environmental goals. Effective community development recognizes the connection between social, cultural, environmental, and economic concerns, the diversity of interests within a community, and how all the elements interact to contribute to building community capacity (Frank, Smith, & Canada, 1999). According to Sail and Abu-Samah (2010), “The goal of community development is to develop members’ capabilities and potentials to affect their well-being and quality of life through maximizing resource utilization to benefit them socially and economically.” Other researchers describe community development in terms of building up seven capitals to create prosperous communities with vital economies, social inclusion, and a healthy ecosystem, known as the Community Capitals Framework (Flora & Flora, 2008).

Community capitals framework

A community capitals framework was created by Flora and Flora (2008) to map the impact capitals have in producing community capacity and well-being. Refer to figure 2.1 below.

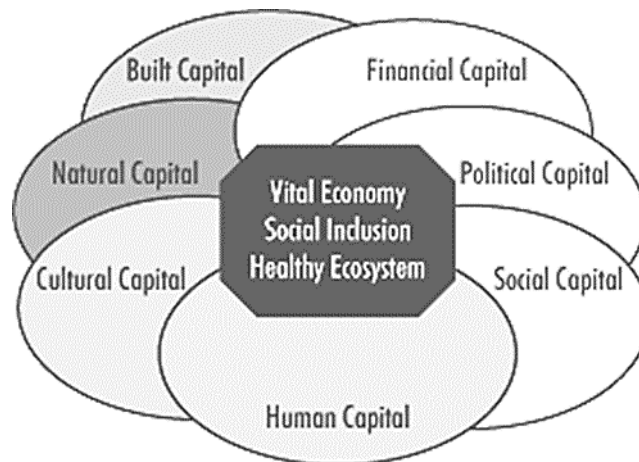


Figure 2.1 Flora and Flora, community capitals framework

Figure 2.1 above displays Flora and Flora's community capitals framework. The seven community capitals are financial, political, social, human, cultural, natural, and built capital (Wichtner-Zoia, 2013). The community capitals framework can be used by communities to identify resources and assets available in the community. When the community invests in their resources and assets (financial, political, social, human, cultural, natural, and built) they become capitals. Investing in one capital can build assets in other capitals, which can be leveraged to support healthy, sustainable communities (Marttila-Losure, 2015; Wichtner-Zoia, 2013). The North Central Regional Center for Rural Development (NCRCRD) summarize the seven capitals in the following manner.

The seven capitals include:

- **Natural capital:** The resources, amenities and natural beauty of a location.
- **Cultural capital:** Reflects the way people “know the world” and how to act within it. Cultural capital influences what voices are heard and listened to, which voices have influence in what areas, and how creativity, innovation, and influence emerge and are nurtured. Cultural capital might include a strong work ethic.
- **Human capital:** The skills and abilities of people, as well as the ability to access outside resources and bodies of knowledge in order to increase understanding and to identify promising practices. Human capital also addresses leadership’s ability to “lead across differences,” to focus on assets, to be inclusive and participatory, and to be proactive in shaping the future of the community or group.
- **Social capital:** Reflects the connections among people and organizations or the social glue to make things happen.
 - **Bonding social capital** refers to those close ties that build community cohesion.

- **Bridging social capital** involves ties that create and maintain bridges among organizations and communities.
- **Political capital:** The ability to influence standards, rules, regulations and their enforcement. It reflects access to power and power brokers, such as access to a local office of a member of Congress, access to local, county, state, or tribal government officials, or leverage with a regional company.
- **Financial capital:** The financial resources available to invest in community capacity building, to underwrite businesses development, to support civic and social entrepreneurship, and to accumulate wealth for future community development.
- **Built capital:** The infrastructure that supports the community, such as telecommunications, industrial parks, main streets, water and sewer systems, roads, etc. (Flora & Flora, n.d.).

The ability to engage in walking by children or adults whether for leisure, transportation, or for exercise, is dependent on built environment and other elements of the geographic community not always readily apparent through simple observation. Geographic information systems technology helps locate various elements that can assist or impede pedestrian mobility in neighborhoods.

Geographic Information Systems

Established links between built environment factors and active living are well documented, although all variables are not readily apparent (Handy, Boarnet, Ewing, & Killingsworth, 2002). For example, even though a sidewalk may be viewed as necessary for walking, its existence does not necessarily imply people will use it. Design qualities in the built

environment such as attractiveness and safety also impact an individual's decision to walk (Cook, Bose, Marshall, & Main., 2013; McCormack & Shiell, 2011; Neckerman et al., 2009).

According to Leslie et al. (2007), "Geographic information systems (GIS) can be used to objectively measure features of the built environment that may influence adults' physical activity in any location. GIS is a computer-based tool for the capture, storage, manipulation, analysis, modeling, retrieval and graphic presentation of spatially referenced information. GIS uses databases and software to analyze location data, revealing hidden patterns, relationships, and trends that may not be apparent in spreadsheets or when using the standard statistical packages from epidemiology or the social sciences." The methodology and technology of GIS allows these spatial patterns to be visualized in many ways through mapping, spatial analysis, and modeling (Leslie et al., 2007). Potential application of GIS involves guiding environmental and policy initiatives to help communities promote overall physical activity level, and develop community and neighborhood walkability (Takahashi, Cha, Targonski, & Baker, 2012).

The Legal Framework

"The law is a potent tool in creating a built environment that is conducive to public health." Legislatures design broad policies, parameters, and processes for making decisions that affect the built environment. Their decisions and policies are then carried out and enforced by planning boards, zoning boards, and administrative agencies. The public can effectively influence those legislative decisions, policy, and laws by intervening early in the process, when broad policies are being made about population density, land-use configurations, transportation, and other issues. Community development can use its voice, expertise, and influence to encourage legislatures and agencies to create and enforce laws designed to ensure community environments that promote healthy lifestyles (Perdue, Stone, & Gostin, 2003).

According to Perdue et al. (2003), the built environment affects health in a number of ways, but it is not enough to simply educate people regarding healthy lifestyles. The built environment must allow and/or promote engaging in healthy behaviors. Perdue et al. (2003), list five main legal avenues to healthier community environments that allow community engagement in healthy lifestyles. Those legal avenues are environmental regulation, zoning and related developmental requirements, building and housing codes, taxing power, and spending power. They are presented below.

- **Environmental Regulation:** These regulations are aimed at improving the built environment by reducing pollutants and ensuring the quality of air and water.
- **Zoning and Related Developmental Requirements:** Zoning laws specify allowable uses of land and buildings and regulate building density and size. Zoning can have powerful effects, good and bad, on communities. Zoning can separate manufacturing from residential areas but can also encourage spread-out suburban patterns where jobs, housing, and retail services are far apart, and residents are entirely automobile dependent. In addition to zoning, communities can impose other requirements on developments. For example, residential developments may be required to provide affordable housing units.
- **Building and Housing Codes:** Building and housing codes designed to ensure buildings are safe, sanitary, and efficient.
- **Taxing Power:** Tax code influence the built environment through tax relief, tax burdens, and the ability to recognize and take title to abandoned property. The government can provide tax incentives to encourage construction of affordable housing and renovate existing buildings or abandoned sites.

- **Spending Power:** Governments can spend resources in ways that create or promote a healthier and safer built environment. The government, for example, can promote physical activity by locating and designing public facilities to encourage pedestrian access, and include sufficient money in funding for adequate sidewalks, bicycle paths, and streetscaping.

In summary, the legal framework and government influence the built environment in various ways, ranging from environmental regulation, zoning, and building codes to economic incentives and disincentives. An informed community can use its voice to encourage legislatures and agencies to create and enforce laws designed to ensure community environments allows people to live healthy lifestyles (Perdue et al., 2003).

Summary of Review of Literature

High rates of overweight and obesity and resultant chronic disease with associated high health care costs are a major concern for all communities. All regions of the U.S. report more than 25% of their residents are beyond overweight, they are obese, with the South and the Midwest reporting the highest rates. In seven states located within the Midwest and Southern regions of the U.S (Alabama, Arkansas, Iowa, Louisiana, Mississippi, Oklahoma, and West Virginia), 35% or more of the adult residents are obese (CDC, 2019).

The effects of an unhealthy lifestyle with little regular exercise and poor quality diet are cumulative throughout life, resulting in the associated health concern, chronic disease, manifesting with greatest frequency after fifty years of age. Consequently, and in part due to the ageing U.S. population, Medicare and Medicaid finance over half of the costs of chronic disease with Medicare covering the larger share (Kaiser Family Foundation, 2015).

The enormous costs of chronic disease threaten to overwhelm the Medicare and Medicaid systems. In 2010, the total costs of heart disease and stroke, often due to obesity, was estimated

to be \$315.4 billion. Of this amount, \$193.4 billion was for direct medical costs, not including costs of nursing home care (Go et al., 2014). In 2012, the total estimated cost of diagnosed diabetes was \$245 billion, including \$176 billion in direct medical costs and \$69 billion in decreased productivity associated with being absent or less productive at work. By 2013, health care costs for people suffering from chronic disease accounted for 86% of the nation's medical care costs (CDC, 2015; Gerteis et al., 2014).

Prevention of costly chronic disease can be as simple as engagement in regular, physical activity/exercise, and increased consumption of healthy foods. Ironically, increases in obesity have occurred even though the public has become more educated regarding what constitutes a healthy diet and healthy portion size, and all ingredients in food products have become clearly identified on labels. This suggests more emphasis is needed on the other major cause of obesity, lack of enough daily physical activity/exercise (Barnes & Schoenborn, 2003; Mokdad et al., 2001).

Physical activity, especially outdoor walking, has been associated with reduced obesity and improved health. Focht (2009) compared the effects of brief walks indoors and outdoors on affective responses, enjoyment, and future intentions to walk for exercise. Both indoor and outdoor walks resulted in improvements in affective responses, but participants reported greater pleasant affective states, enjoyment, and intention for future participation after outdoor walking. In addition, physical exhaustion during outdoor walking correlated with intention for future participation. These findings suggest that outdoor environments positively influence the intent to continue walking in the future even if the exercise results in physical exhaustion. The same was not true of walking indoors on an indoor track or treadmill.

Individuals in walkable communities with residential neighborhood sidewalks experience better health, enhanced sense of self, and a greater sense of community than individuals living in unwalkable communities (Lund, 2002). Socioeconomic factors including living in unsafe, unwalkable neighborhoods have been found to be a primary deterrent to physical activity for low income, low socioeconomic status individuals (Eylar et al, 2003). On the other hand, lack of available time has been found to be a deterrent to physical activity for individuals of both low and high socioeconomic status (Brownson et al., 2001; Spinney & Millward, 2010).

Past research that ignored socioeconomic status and related factors (low quality food and illegal drug use) found low income individuals who were obese experienced obesity related health issues which needed treatment, but still had better health outcomes than those who were not obese. This prior research supported the obesity paradox, the medical hypothesis which states obesity may, counterintuitively, lead to better health outcomes for some groups of people (Hainer & Aldhoon-Hainerova, 2013). There are indications those prior studies that ignored socioeconomic status and related factors may have wrongly reduced the importance of exercise and raised the importance of diet in treating health issues related to obesity. Consequently, due to conflicting information, as the public received more information regarding how to reduce obesity through improved and/or restrictive diets, the rates of obesity and chronic disease have increased. This suggests regular exercise and providing built environments that promote physical activity and exercise needs to be given more emphasis when combatting obesity and chronic disease.

Loosely defined, the built environment consists of the neighborhoods, roads, buildings, food sources (restaurants, grocery stores, etc.), and recreational facilities in which people live, work, are educated, eat, and play (Sallis & Glanz, 2006). The built environment can promote

physical activity and contribute to a reduction in obesity by providing safe swimming places, campgrounds, bike paths, walking trails, and sidewalks (Flora & Gillespie, 2009).

Walking is a perfect exercise for most individuals. It is an activity that does not require special skills or equipment and can be performed within one's neighborhood if there is appropriate infrastructure. Communities with accessible, maintained sidewalks and biking paths promote daily physical activity which lowers the health risks that are often the byproducts of a sedentary lifestyle (Gorelick et al., 1999; Wannamethee et al., 1998). The walkability of a community is defined by the extent to which characteristics of the built environment and land use may or may not be conducive to residents walking for leisure, exercise, to access services, or to travel to work. Walkability of a neighborhood measures whether a community's design encourages or inhibits walking (Leslie et al., 2007). Research has revealed a relationship between walking, walkability, and sense of community and enhanced well-being. Lund (2002) found the frequency of walking within neighborhoods was associated with more unplanned interactions with neighbors which contributed to relationship formation. Feelings of ties with one's neighborhood and fellow residents have been linked to a range of community level outcomes that influence well-being (McMillan & Chavis, 1986). These outcomes directly and indirectly influence health by providing social support, increasing social networks, and helping to build ties to the community (Ball et al., 2007; Berkman, 2001; Department of Health and Aged Care, 2000; Wood et al., 2010). There are multiple avenues to sense of community through enhancing individual health and developing social bonds within a community, all elements of community development.

Effective community development results in mutual benefit and shared responsibility among community members, and recognizes the connection between social, cultural,

environmental, and economic concerns (Frank et al., 1999). According to Sail and Abu-Samah (2010), “The goal of community development is to develop members’ capabilities and potentials to affect their quality of life through maximizing resource utilization to benefit them socially and economically.” The community capitals framework, created by Flora and Flora (2008), map the impact capitals play in a community's well-being. The community capitals are financial, political, social, human, cultural, natural, and built capital.

The legal framework and government influence the built environment in various ways, ranging from environmental regulation, zoning, and building codes to economic incentives and disincentives. An informed community can use its voice to encourage legislatures and agencies to create and enforce laws designed to ensure community environments allow people to live healthy lifestyles (Perdue et al., 2003). Information from geographic information systems could be used to assist communities in guiding environmental and policy initiatives to help promote overall physical activity level and develop community and neighborhood walkability (Takahashi, Cha, Targonski, & Baker, 2012).

CHAPTER 3. METHODOLOGY

Study Design

This study took place in a small, rural community, Forest City, in Iowa, one of the seven states with the highest rates of obesity in the nation. The study used a natural experiment to investigate the relationship between an element of the built environment, sidewalks, and engagement in physical activity/exercise and self-perceived health status of adults living in adjacent residential neighborhoods in two adjacent voter precinct wards. An advantage of a natural experiment is the investigator can study the impact a pre-existing element, an independent variable, has on a population (Craig, et al., 2012). In this study the pre-existing element, the independent variable, was the presence or absence of sidewalks in two residential working class neighborhoods. One neighborhood had sidewalks and the other did not. Housing in the neighborhood without sidewalks was constructed in the early 1970s to accommodate the influx of individuals who relocated to Forest City from distant communities to work in Winnebago Industries, a manufacturer of recreational vehicles. Of current Forest City adults in the workforce, 38% are employed in manufacturing, primarily in Winnebago Industries (American FactFinder, 2018; State Data Center, 2017; Winnebago Industries, Inc., 2018).

The purpose of the study was to determine if there was an association between the independent variable, presence or absence of sidewalks in residential neighborhoods, and select dependent variables, favorite exercise, actual exercise performed, number of days per week engaged in exercise, time spent in each exercise session, self-perception of health status, and food choices. The **general theory** guiding the study was *physical activity promotes healthy lifestyles*.

The **research question** that drove the study was *How can community development initiatives promote rural, residential built environments that help combat obesity?* The research questions for this study were formulated with intent of finding whether an element of the residential built environment (sidewalks) promotes healthier lifestyles in rural communities. The survey-based research presented in this paper answers the following **research sub questions**: Do sidewalks in residential neighborhoods encourage physical activity/exercise by adult residents of the neighborhood? Do adults living in residential neighborhoods with sidewalks record more hours of exercise per week than adults in residential neighborhoods without sidewalks? Do adults living in residential neighborhoods with sidewalks indicate better health than adults living in residential neighborhoods without sidewalks? Do adults living in residential neighborhoods with sidewalks consume healthier foods than adults living in neighborhoods without sidewalks?

The study employed a survey to gain information regarding a population represented by two residential working class neighborhoods/wards in Forest City, Iowa. The following description includes the study population and sample, sampling frame, sampling technique, and sample size.

Description of the Sample

Study Population

Forest City, Iowa, population 4,151, has four voting precinct wards (American FactFinder, 2013). The residential neighborhoods in wards 1, 2, and 4 were constructed with sidewalks in a straight linear design. Residential neighborhoods in ward 3 were constructed with curvilinear streets, cul-de-sacs, and no sidewalks. The map in Figure 3.1 below displays voter precinct wards 1, 2, 3, and 4. The map shows the primarily linear streets and linear sidewalks in wards 1, 2, and 4, and the primarily curvilinear streets with no sidewalks in ward 3 (Forest City Chamber of Commerce, 2018).

The study population included all adults over age eighteen living in residential neighborhoods in voter precinct ward 2 with sidewalks, and voter precinct ward 3 without sidewalks. Due to the difference in residential neighborhood infrastructure design (sidewalks or no sidewalks), it was possible to compare survey responses from the two neighborhoods/wards in order to determine if there were differences in exercise patterns, dietary preferences, and self-perceived health status in residential neighborhoods with sidewalks compared to residential neighborhoods without sidewalks.

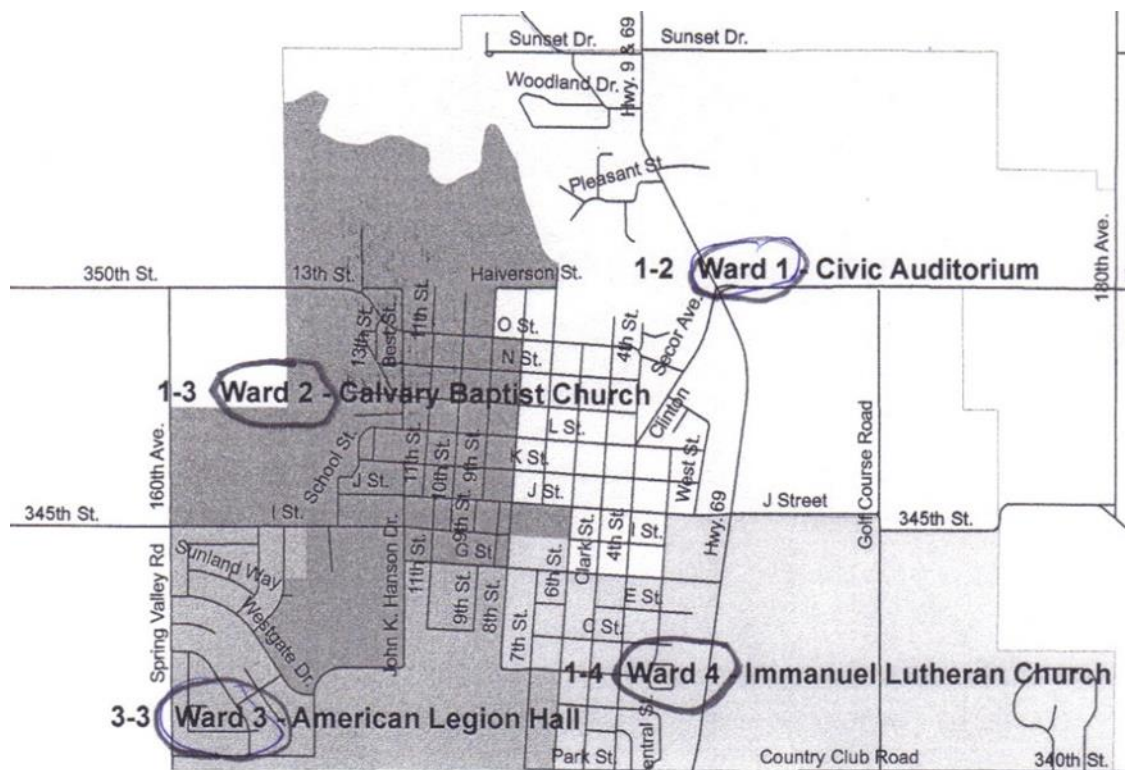


Figure 3.1 Voter prescient map of Forest City, Iowa

In order to statistically compare the two residential neighborhoods/wards, socio economic status (SES) of each neighborhood/ward needed to be analyzed. There are several well-known univariate or proxy measures for SES. They are income, wealth, educational attainment, and area/contextual level measures of a neighborhood. The advantage of using household income as a proxy for SES is its relatively easy to measure by simple questioning of study participants. The

disadvantage is for some individuals, household income can fluctuate considerably throughout the year. Wealth, or net worth, as a proxy for SES has the advantage of being generally somewhat stable. Net worth includes all assets minus liabilities. Real estate investments (a home), all financial investments and retirement accounts are included in net worth. Thus, net worth often is an excellent reflection of SES. However, the disadvantage of using net worth as a proxy for SES is calculating net worth is a very time-consuming process, requiring in-depth financial information of prospective study participants. Educational attainment can be easily determined but does not always reflect increased economic status and therefore has decreased in value relative to other measures. Location and all the contextual elements of a neighborhood are excellent indicators of SES. The disadvantage of using contextual elements of a neighborhood as the proxy for SES is it requires residential address information that is not always reliable. The advantages and disadvantages of the four primary proxy measures of SES are summarized in table 3.1 below (HHS, n.d.).

Table 3.1 Proxy measures for socioeconomic status (SES)

Proxy Measure of SES	Advantages	Disadvantages
Household income	Relatively easy way to capture ability to purchase desired resources	Can be volatile, can fluctuate throughout a year
Wealth	Status is maintained over economic shock, such as job loss	Time-consuming to measure
Educational attainment	Can be determined for all individuals	Increasing variability relative to some other measures
Area/contextual, neighborhood	Captures the richness of latent SES measures	Requires residential address information; not always reliable

Of the four SES proxy measures, only household income was a realistic proxy for this study. Wealth, or net worth, used as an SES proxy requires knowledge of individual study participants that was not available in this study. Educational attainment was not a reliable proxy of SES for the community used in this survey, Forest City, Iowa. Some Forest City residents without education beyond high school have stock investments in Winnebago Industries which is located in the community (Winnebago Industries, Inc., 2018). These individuals might have a

high income from stock investments and consequently enjoy both high social status and high economic status within the community. Regarding contextual neighborhood qualities as proxies for SES, latent SES measures from neighborhood observations can be difficult to assess in small towns where individuals may live in the same neighborhood their entire lives and find no advantage in changing neighborhoods as income increases. Household income was determined to be the demographic characteristic most likely to reflect SES of the study population. Therefore, categories of household income were used as the proxy measure for SES in this study.

Finding an accurate, simple measure of overweight and obesity was challenging. Body mass index (BMI) is a commonly used measure of overweight and obesity but is not always reliable. In a research study of BMI using a primarily young demographic, individuals considered overweight by a simple BMI measure were found to be cardiometabolically healthy in part due to BMI not distinguishing between body mass due to muscle mass and body mass due to adipose tissue, i.e. fat (Tomiya et al., 2016). Additionally, BMI requires measurements which can be complicated for individuals to obtain without appropriate measurement tools or instruction. Regular exercise, five or more days each week for at least 15 minutes to 1 hour each day, is the optimum time to spend in exercise per week and has been found to reduce overweight and obesity (Laskowski, 2019). Therefore, for this study engaging in daily, physical activity and making healthy food choices were used as indicators of living a healthy lifestyle and probable reduced incidence of obesity.

Self-perceived health was used as a proxy for health status in this study despite possible discrepancies between self-perceived and actual health. A study by Loprinzi (2015) found three populations were likely to exhibit discrepancy between self-perceived health status and actual health. Those three populations were young adults, individuals with high SES, and non-Hispanic

Blacks. Those three populations are not highly represented in the population from which the survey participants in this study were drawn (State Data Center, 2017), and therefore did not affect conclusions from analysis of self-perceived health data obtained from survey participants.

Sampling Frame

The sample frame for this study was the list of names and addresses of all voting age adults residing in wards 2 and 3 in Forest City, Iowa. The list of names was obtained from the Winnebago County Court House, located in Forest City, Iowa (Winnebago County Courthouse, 2016).

Sampling Technique

Simple random sample, the simplest form of probability sampling, was used to collect the data. Simple random sampling was used because Forest City, Iowa, is a small town, population 4,151, with a homogenous demographic with few, if any, subgroups (State Data Center, 2017).

Sample Size

The sample frame for the survey, the number of adult residents living in wards 2 and 3, is referred to as the Precinct Voter Count. The count, presented in table 3.2, is a file in the Winnebago County Auditor's Office in the Winnebago County Courthouse located in Forest City, Iowa.

Table 3.2 Winnebago County, Iowa, Forest City, Iowa, precinct voter count

<i>Forest City, Iowa</i>	<i>Precinct voter count</i>
<i>Forest City ward 1 precinct voter count</i>	<i>699</i>
<i>Forest City ward 2 precinct voter count</i>	<i>525</i>
<i>Forest City ward 3 precinct voter count</i>	<i>634</i>
<i>Forest City ward 4 precinct voter count</i>	<i>449</i>
<i>Grand Total</i>	<i>2307</i>

The Precinct Voter Count indicates ward 2 had 525 voting age residents and ward 3 had 634 voting age residents. Ward 2 sample frame was reduced from 525 to 470 due to removal of

names of people living in residences with country addresses, or on streets without sidewalks.

The ward 3 sample frame was reduced from 634 to 528 due to the removal of names of people living in residences on streets with sidewalks. Using the online calculator supplied by Creative Research Systems (2012), the required sample size calculated to 212 for ward 2 and 210 for ward 3, with a confidence level of 95% and a confidence interval of 5. The calculated number of potential survey participants (n) and percent (%) are displayed in table 3.3 below.

Table 3.3 Forest City, Iowa, voter precinct wards 2 and 3 required sample size

<i>Location</i>		<i>n</i>	<i>%</i>
<i>Ward 2, sidewalks</i>	<i>Required sample size</i>	<i>212</i>	<i>50.2</i>
<i>Ward 3, no sidewalks</i>	<i>Required sample size</i>	<i>210</i>	<i>49.8</i>
<i>Totals</i>		<i>422</i>	<i>100</i>

A Microsoft Excel spreadsheet was used to randomize and choose 212 residents from 470 ward 2 residents and 210 residents from 528 ward 3 residents. The random sample of residents over 18 years old living in voter precinct Wards 2 and 3 was acquired in the following manner.

For each ward:

1. Obtained the sample frame (digital list of names and addresses of all voting age adults residing in wards 2 and 3 in Forest City, Iowa) from the Winnebago County Courthouse.
2. Reduced the list due to street irregularities, copied and pasted the list of names (and addresses) into a column in an EXCEL spreadsheet.
3. In the column right next to the names, placed the function =RAND() and copied it down the column. The function =RAND() puts a random number between 0 and 1 in each cell.
4. SORT both columns by the random numbers' column, lowest to highest. This rearranged the list in random order from the lowest to the highest random number.
5. Took the names and addresses from the sorted list, taking the number determined necessary for the sample, the sample size, 212 ward 2 names and 210 ward 3 names.

Of the 422 (212+210) surveys sent out, eighteen were returned with a postal coding that stated, *Return to Sender, Unable to Forward*. Consequently, 404 (422-18) surveys were delivered, 203 delivered to ward 2 residents, and 201 delivered to ward 3 residents. The number (n) and percent (%) of surveys delivered to each ward is displayed in table 3.4.

Table 3.4 Number (n) of delivered surveys

<i>Location</i>		<i>n</i>	<i>%</i>
<i>Ward 2, sidewalks</i>	<i>Surveys delivered</i>	<i>203</i>	<i>50.2</i>
<i>Ward 3, no sidewalks</i>	<i>Surveys delivered</i>	<i>201</i>	<i>49.8</i>
<i>Totals</i>		<i>404</i>	<i>100</i>

Measurement Technique

This study employed a survey to gain information regarding the study population. There were three questions on the survey regarding demographics and seven questions regarding the dependent variables. The dependent variables, the variables potentially influenced by the independent variable, were the items measured by the survey.

The Survey

To determine if the presence of sidewalks was associated with engagement in regular exercise and self-perception of good to excellent health, the survey collected data regarding study participant's self-perceived health status, food consumption, favorite exercise, actual exercise performed, days per week engaged in exercise, time spent per exercise session, and reason for not exercising. Survey instructions explained what was included in exercise, along with instruction to place a check mark "✓" or an "X" in the box in front of chosen answers. The words ward 2 or ward 3 was typed on the top of the surveys sent to potential survey participants. As the surveys were completed and returned a number was written on the top right corner of each survey. The numbering started at number 1 and ended with number 162 on the last survey completed and returned. No other identification was on the survey.

The survey used closed end questions regarding health status, types of food consumed, and exercise activities. The survey was two pages in length (one page, front and back). The variables, measures, and survey questions are listed in table 3.5 below.

Table 3.5 Variables, measures, and survey questions used in analysis

Variable	Measure	Survey Question
Perception of health	Survey	Question 1: How is your health? <ul style="list-style-type: none"> • Excellent health • Good health - for my age • Average - for my age • Poor health • Very poor health

Variable	Measure	Survey Question
Food choices	Survey	Question 2: In a typical week, how many times each week do you eat the following? Never, Not too often, Several times a week, Daily <ul style="list-style-type: none"> • Vitamins or supplements (any kind) • Fresh fruits and vegetables OR Frozen-fresh (bags of frozen veggies, strawberries, etc.) • Protein - meat, fish, eggs, beans, cheese • Whole grain bread, or whole grain cereal • Store-bought TV dinners (frozen dinners) • Canned vegetables (store-bought in cans) • Junk food (Hostess cupcakes, chips, sugar coated cereals, etc.)

Variable	Measure	Survey Question
Favorite exercise	Survey	Questions 3: Which is your favorite exercise even if it's not the one you do the most. Please pick one. <ul style="list-style-type: none"> • Walking (includes walking-for-exercise, walking to work, walking to class, walking uptown, or on a treadmill) • Running or jogging (outdoor OR on a treadmill) • Lift weights • Bike (outdoors or stationary bike) • YMCA or Park & Rec: organized sports, fitness classes of any kind • Pilates or Yoga • NOTHING! I don't exercise

Variable	Measure	Survey Question
Exercise actually performed	Survey	Question 4: OK, now which exercise do you actually do most often? (It might not be your favorite exercise) <ul style="list-style-type: none"> • Walking (includes walking-for-exercise, walking to work, walking to class, walking uptown, or on a treadmill) • Running or jogging (outdoor OR on a treadmill) • Lift weights • Bike (outdoors or stationary bike) • YMCA or Park & Rec: organized sports, fitness classes • Pilates or Yoga

Table 3.5 continued

Variable	Measure	Survey Question
Days per week engaged in exercise	Survey	Question 5: If you exercise, how many times to you exercise in a typical week? (Any exercise - walking, sports, etc.) <ul style="list-style-type: none"> • 1 or 2 days each week • 3 or 4 days each week • 5 or more days each week
Variable	Measure	Survey question
Time spent per exercise session	Survey	Question 6: When you exercise, how much time do you usually exercise? (Any exercise -walking, sports, etc.) <ul style="list-style-type: none"> • Less than 15 minutes • 15 to 60 minutes • 60 minutes (1 hour) or more
Variable	Measure	Survey question
Reason for no exercise	Survey	Question 7: If you don't exercise, or if you skip a day, what is your reason? <ul style="list-style-type: none"> • No sidewalks to use for walking, jogging, or biking where I live • Lack of time • Not interested in exercising • Can't afford YMCA or any health club dues and/or can't afford equipment

Conducting the Survey

After receiving confirmation from Iowa State University Institutional Review Board (IRB) that the study was exempt from the requirements of human subject protection regulations (Appendix A), the study was ready to proceed to the next step, conducting the survey. There was a total of three mailings to all names and addresses in the study's random sample. The three mailings were 1) an initial postcard of introduction, 2) a packet of information including the survey, and 3) a follow-up postcard.

The initial postcard (Appendix B) was sent to each person whose name and address was on the list of names in the random sample. The postcard included a brief introduction from me, investigator Linda Johanson, an explanation of what was taking place and notice of the coming survey. One week after the introductory post card was sent, a packet of information was sent to each person whose name and address was on the list of names in the random sample. The packet

included a letter of introduction and disclosure information (Appendix C), a business card with my contact information on the front and a Quick Reference (QR) code for my ISU web site on the back (Appendix D), and the survey (Appendix E and F). Two weeks after the survey was sent, a postcard was sent to each person whose name and address was on the list of names in the random sample thanking those who had returned the survey and requesting those who hadn't returned the survey to fill in and return the survey before the end of the month (Appendix G).

Of the 404 surveys sent and received by residents, 162 were completed and returned, resulting in a 40.1% (162/404) response rate for the survey. There were 78 survey respondents from ward 2, the ward with sidewalks, and 84 survey respondents from ward 3, the ward without sidewalks. Residents from ward 2 represented 48.1% of the surveys returned and residents from ward 3 represented 51.9% of the surveys returned. The number (n) of survey respondents from each ward and the representative percent (%) per ward is displayed in Table 3.6.

Table 3.6 Frequency (n) of response

<i>Location</i>		<i>n</i>	<i>%</i>
<i>Ward 2, sidewalks</i>	<i>Number of participants</i>	78	48.1
<i>Ward 3, no sidewalks</i>	<i>Number of participants</i>	84	51.9
<i>Totals</i>		162	100

Survey participants could access survey results by scanning a Quick Reference (QR) code, Figure 3.2 below, with a smartphone. The web site associated with the QR code displayed results of the survey.



Figure 3.2 QR code of web site displaying survey results

CHAPTER 4. RESULTS

Overview

This chapter presents analysis of data gathered from the survey used in this study. Chi-square test of independence was used to examine the relationship of demographic variables of survey participants to place of residence. Spearman's rho rank order correlation, Mann-Whitney U, Kruskal-Wallis, Pearson's product-moment correlation, and an independent samples t test were used to investigate relationships between the hypothesized predictor variable, presence or absence of residential neighborhood sidewalks, and outcome variables, favored and actual exercise performed, reason for not exercising, days per week engaged in exercise, time spent per exercise session, self-perceived health status, and food choices. A medium sample size ($n=162$) permitted interpretation and discussion of results significant at $p < .05$ level (Cohen, 1992).

Survey Results

Response Rate

Of the 422 (212+210) surveys sent, eighteen were returned with postal coding, *Return to Sender, Unable to Forward*, resulting in 404 successful deliveries. Of the 404 surveys delivered, 203 were delivered to ward 2 residents, and 201 were delivered to ward 3 residents. Of those 404 surveys, 162 were completed and returned, resulting in a 40.1% (162/404) response rate. Of the 162 completed and returned surveys, 78 (48.1 %) were from ward 2, the ward with sidewalks, and 84 (51.9 %) were from ward 3, the ward without sidewalks. The count (n) and percent (%) of surveys delivered, completed and returned, and response rate are presented in table 4.1 below.

Table 4.1 Count (n), percent (%) surveys delivered, completed, returned, and response rate

<i>Location</i>		<i>n</i>	<i>% of total</i>			<i>n</i>	<i>% of total</i>
<i>Ward 2</i>	<i>Surveys delivered</i>	203	50.2	<i>Completed</i>		78	48.1
<i>Ward 3</i>	<i>Surveys delivered</i>	201	49.8	<i>Completed</i>		84	51.9
	<i>Total</i>	404	100.0	<i>Total</i>		162	100.0
<i>Response rate</i>		<i>162/404=40.1%</i>					

Each survey was associated with two identifiers. The location, ward 2 or ward 3, was typed on the top of the surveys sent to potential survey participants. As the surveys were completed and returned a number was written on the top right corner of each survey. The numbering started at number 1 and ended with number 162 on the last survey completed and returned. No other identifying information was on the completed and returned surveys. Collected data from the survey was entered in an Excel spreadsheet. In Excel, two identifier codes were associated with the data from each survey. The identification numbers 1 to 162 was entered in the leftmost Excel column, representing each survey completed and returned, and the number 2 or 3 entered in the next column to identify where the data came from, ward 2 or ward 3. The Excel data was transferred to Statistical Package for the Social Sciences (SPSS) software to locate relationships between the predictor variable, presence and absence of sidewalks in residential neighborhoods, and the outcomes, self-perception of health, food choices, favorite exercise, actual exercise engaged in most often, number of days per week engaged in exercise, length of time of each exercise session, and reason for not engaging in exercise.

Demographics

The survey in this study was based on a comparison of two groups of individuals who were residents of two adjacent, working class, residential neighborhoods. The two neighborhoods represented two adjacent voter prescient wards, ward 2 with sidewalks and ward 3 without sidewalks, in Forest City, Iowa. The locations of the wards are shown in the Forest City, Iowa, voter precinct ward map, figure 4.1 below. This study focused on residents of ward 2, the ward with sidewalks, and ward 3, the ward without sidewalks. Housing in the ward without sidewalks was constructed in the early 1970s to accommodate the influx of individuals who relocated to Forest City to work in Winnebago Industries, manufacturer of recreational vehicles.

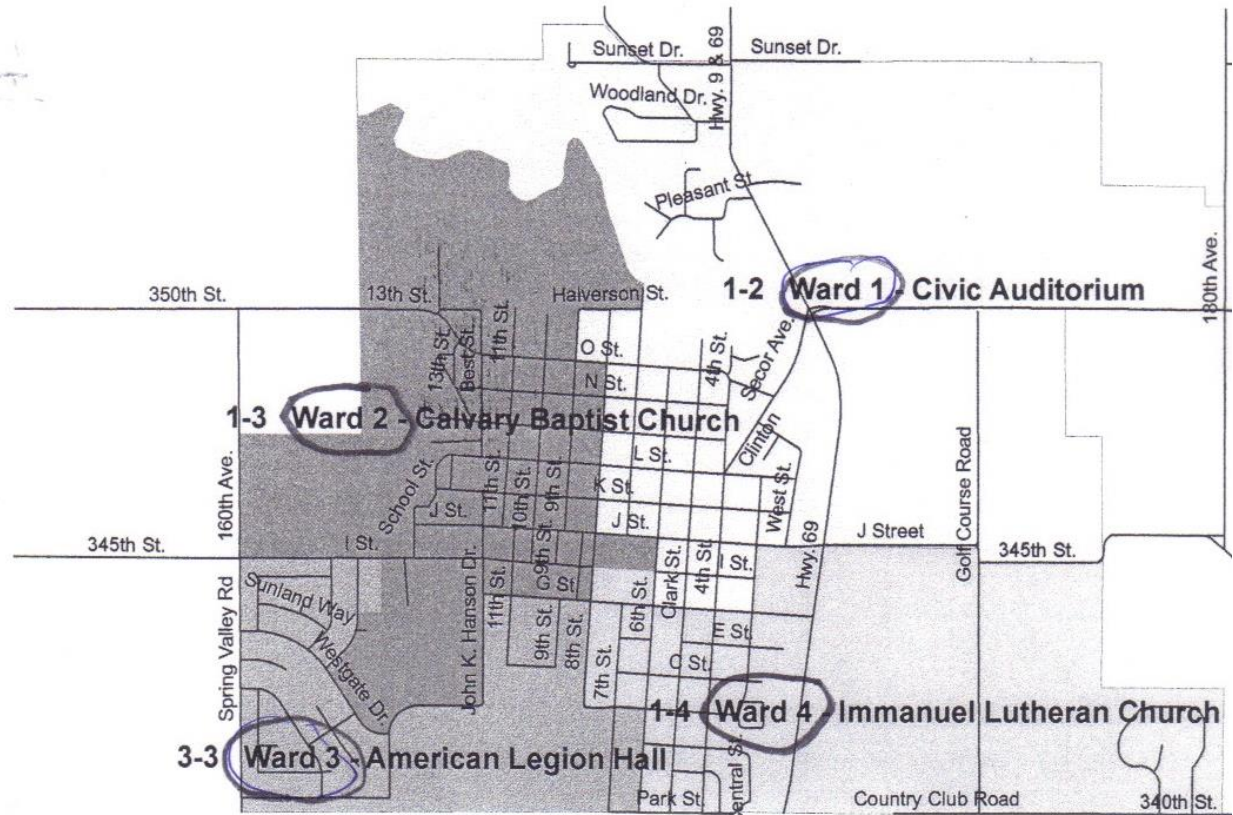


Figure 4.1 Forest City, Iowa voting precinct wards

The purpose of the survey was to gather data regarding exercise routines and diets of two groups of individuals who were assumed to differ only by location of residence. Therefore, it was important to analyze the demographic variables, gender, age, and income, of survey participants to ascertain the demographic variables were independent of residency in ward 2 with sidewalks or ward 3 without sidewalks.

The first three questions on the survey concerned demographic characteristics, gender, age and income. The results are presented below, with a summary table at the end of this section.

Gender

Of the 162 survey respondents who completed and returned surveys, two individuals did not select a gender. Of the 160 (162-2) survey respondents who answered the gender question, 95 (59.4%) were female and 65 (40.6%) were male. Of the 95 female respondents, 47 were from

ward 2 and 48 were from ward 3. Of the 65 male respondents, 30 were from ward 2 and 35 were from ward 3. The gender count (n) and percent (%) of survey respondents are presented in table 4.2 below.

Table 4.2 Count (n), percent (%) gender by location

<i>Location</i>	<i>Count, Percent</i>	<i>Female</i>	<i>Male</i>	<i>Totals, per ward</i>
<i>Ward 2 (sidewalks)</i>	<i>Count (n)</i>	47	30	77
	<i>Percent (%)</i>	61.0%	39.0%	100.0%
<i>Ward 3 (no sidewalks)</i>	<i>Count (n)</i>	48	35	83
	<i>Percent (%)</i>	57.8%	42.2%	100.0%
<i>Total, both wards</i>				
<i>Totals (Ward 2 + Ward 3)</i>	<i>Count (n)</i>	95	65	160
	<i>Percent (%)</i>	59.4%	40.6%	100.0%

Although the proportion of male to female survey respondents was unequal in each ward, the distribution of the gender data was similar for both places of residence, wards 2 or ward 3. A chi-square test for independence (with Yates Continuity Correction) indicated there was no statistically significant relationship between gender and ward of residence, ($X^2 (1, n = 160) = .06, p = .680$), (2 X 2 table continuity correction $p = .801 > .05$). Because the significance of .80 (80%) is much larger than the alpha value of .05 (5%), the null hypothesis was accepted as true, there was no association between the two groups on the measured variable. Gender and place of residence had an independent relationship.

Age

There were four age categories on the survey. They were 18 to 29 years, 30 to 49 years, 50 to 70 years, and over 70 years old. Two individuals, one from each ward, did not answer the question regarding age. Of the 160 (162-2) survey respondents who answered the age question, the category representing the least number of respondents was the 18 to 29 age group. Of the 18 to 29 age group, 7 were from ward 2 and 5 were from ward 3, representing a combined total of only 7.5% of the surveys completed. Of the 30 to 49 age categories, 12 were from ward 2 and 23 were from ward 3, representing a combined total of 21.9% of the surveys completed. The age

group returning the most surveys from both wards was the 50 to 70-year-old age category. Of this age category, 38 were from ward 2, and 37 from ward 3, representing 46.9% of the total number of survey respondents. Of the over 70 age category, 20 were from ward 2, and 18 were from ward 3, representing a combined total of 23.9% of the surveys completed. The count (n) and percent (%) of the age groups of the survey respondents are presented in table 4.3 below.

Table 4.3 Count (n), percent (%) 4-age groups by location

<i>Location</i>	<i>Count, Percent</i>	<i>18 to 29</i>	<i>30 to 49</i>	<i>50 to 70</i>	<i>Over 70</i>	<i>Totals</i>
<i>Ward 2 (sidewalks)</i>	<i>Count (n)</i>	7	12	38	20	77
	<i>Percent (%)</i>	9.1%	15.6%	49.4%	26.0%	100.0%
<i>Ward 3 (no sidewalks)</i>	<i>Count (n)</i>	5	23	37	18	83
	<i>Percent (%)</i>	6.0%	27.7%	44.6%	21.7%	100.0%
<i>Totals (Ward 2 + Ward 3)</i>	<i>Count (n)</i>	12	35	75	38	160
	<i>Percent (%)</i>	7.5%	21.9%	46.9%	23.8%	100.0%

As displayed in table 4.3 above, the age groups were similar but not evenly dispersed between the wards. Chi-square test for independence was run to test for relationship between the variables, age and place of residence. The statistical analysis indicated that although the data was dissimilar between the wards, the differences were not statistically significant, (X^2 (3, n = 160) = 3.69 p = .30 > .05, Cramer's V = .15). The p value of .30 is larger than the alpha value of .05, therefore age and place of residence were independent variables.

Income

There were four income categories to choose from. The categories were less than \$40,000, representing the lower income classification, \$41,000 to \$80,000 and \$81,000 to 120,000, representing middle income classification, and over \$120,000 representing high income classification (Fry & Kochhar, 2018). Of the 162 individuals who completed and returned surveys, 23 did not indicate their household income.

Of the 139 (162-23) individuals who replied to the income question, only one person, identification number 37 from ward 3, represented the high-income category, over \$120,000,

creating an outlier. An outlier is a data value that is very different from the other data in a data set. Consequently, an outlier can skew results of statistical analysis, primarily the mean and standard deviation but not the median of a large data set. In this study the outlier was removed as a precaution. The data set was not small, 139 survey participants replied to this question, representing 139 data points. Therefore, I choose to make \$120,000 the upper bound for income data, effectively removing the single over \$120,000 data point from the income data analysis. As displayed in figure 4.2 below, the data point represented by the dot and number 37 at the top right of the right boxplot is treated by SPSS as an outlier.

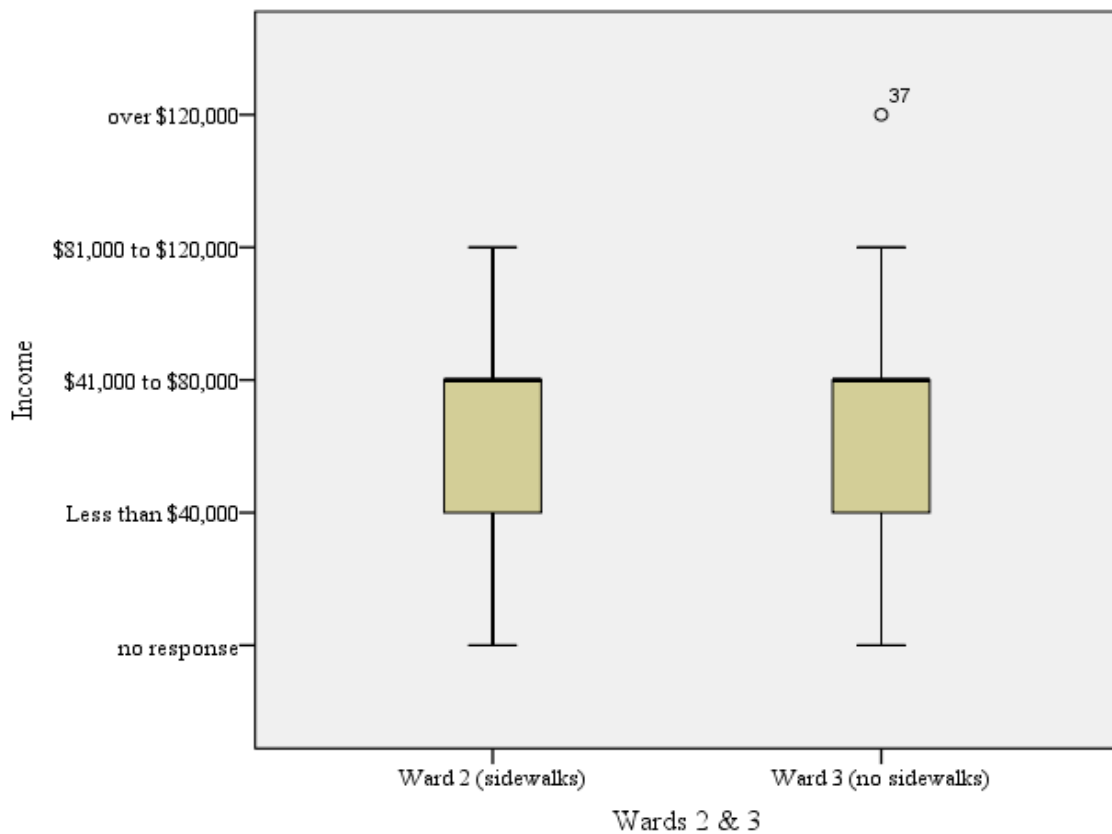


Figure 4.2 Income by place of residence (ward) with outlier

After removal of the outlier three income categories remained in the income analysis. The categories were less than \$40,000, \$41,000 to \$80,000, and \$81,000 to \$120,000 income. The

distributions of the two data sets remained the same after removal of the outlier, as displayed in figure 4.3 below.

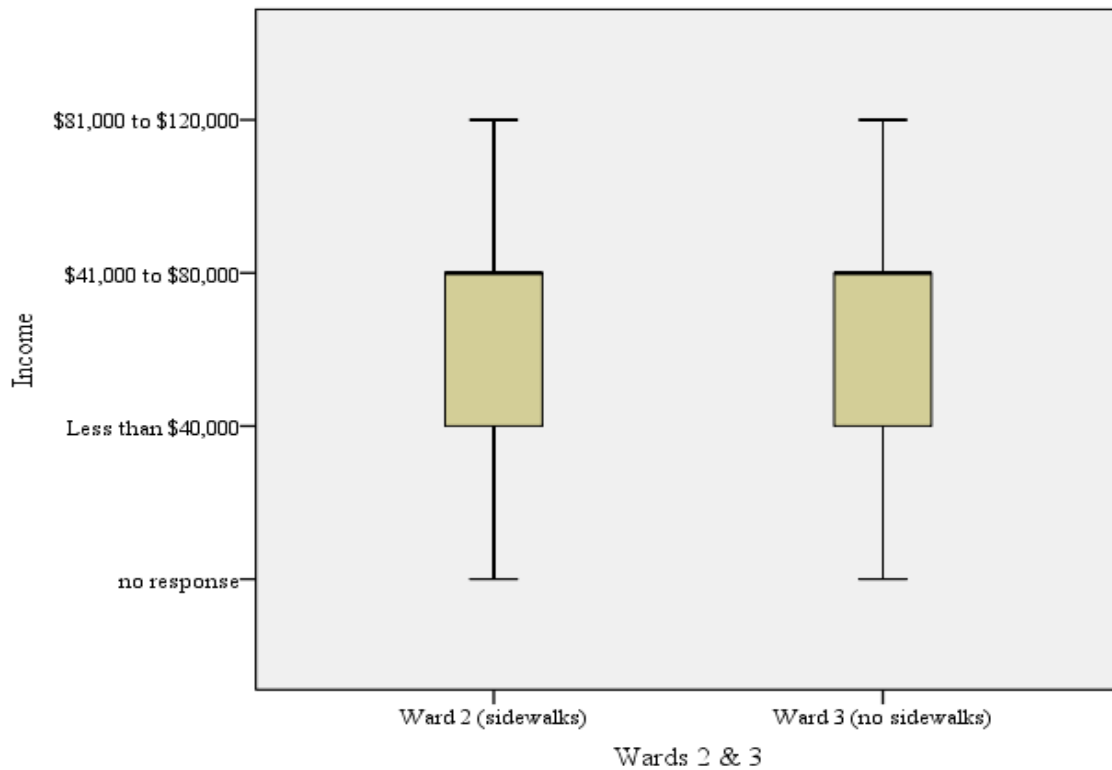


Figure 4.3 Income by place of residence (ward) outlier removed

The count (n) and percent (%) of the income categories of survey respondents are presented in table 4.4 below. As displayed in table 4.4, of the 138 survey respondents who remained in the income data analysis after removal of the outlier, 46 identified as less than \$40,000. This group of 46 represented 33.3% of the survey respondents who answered the question, 22 from ward 2 and 24 from ward 3. The income category between \$41,000 to \$80,000 was represented by 69, 50.0%, of the respondents who answered the question regarding income. Of the 69, 29 were from ward 2 and 40 were from ward 3. The \$81,000 to \$120,000 income category was identified by 16.7% of the survey respondents who answered the question regarding income. Of the \$81,000 to \$120,000 income category, 10 from ward 2 and 13 from ward 3.

Table 4.4 Count (n), percent (%) income categories by location

<i>Location</i>	<i>Count, Percent</i>	<i>Less than \$40,000</i>	<i>\$41,000 to \$80,000</i>	<i>\$81,000 to 120,000</i>	<i>Totals</i>
<i>Ward 2 (sidewalks)</i>	<i>Count (n)</i>	22	29	10	61
	<i>Percent (%)</i>	36.1%	47.5%	16.4%	100.0%
<i>Ward 3 (no sidewalks)</i>	<i>Count (n)</i>	24	40	13	77
	<i>Percent (%)</i>	31.2%	51.9%	16.9%	100.0%
<i>Totals (Ward 2 + Ward 3)</i>	<i>Count (n)</i>	46	69	23	138
	<i>Percent (%)</i>	33.3%	50.0%	16.7%	100.0%

Although table 4.4 above indicates there were differences in distribution of income between the wards, a chi-square test for independence found the differences did not rise to the level of statistical significance, ($X^2 (2, n = 138) = .382, p = .826 > .05$, Cramer's $V = .053$). The p value of .83 is much larger than the alpha value of .05. Therefore, statistical tests indicate income was not associated with place of residence.

Summary: Chi-Square Test of Independence, Demographic Variables and Location

Table 4.5 displays a summary of the results of a chi-square test of independence between all demographic variables and residence. All demographic variables were found to be independent of location of residence in the two working class, residential neighborhoods/wards.

Table 4.5 Summary: Chi-square test of independence, location by demographic variables

<i>Location X Variable</i>	<i>N</i>	<i>p-value</i>	<i>Significance</i>
<i>Gender</i>	160	.801	$p > .05$
<i>Age</i>	160	.300	$p > .05$
<i>Income</i>	138	.830	$p > .05$
<i>No significant association exists between gender, age, income, and location</i>			

Research Question

The research question that drove the study was *How can community development initiatives promote rural, residential built environments that help combat obesity?* The question produced four sub questions. The research sub questions for this study were formulated with

intent of finding whether an element of the residential built environment (sidewalks) promotes healthier lifestyles in rural communities.

Survey results are organized under their related research sub question. The research sub questions were: Do sidewalks in residential neighborhoods encourage physical activity/exercise by adult residents of the neighborhood? Do adults living in residential neighborhoods with sidewalks record more hours of exercise per week than adults living in residential neighborhoods without sidewalks? Do adults living in residential neighborhoods with sidewalks indicate better health than adults living in residential neighborhoods without sidewalks? and, Do adults living in residential neighborhoods with sidewalks consume healthier foods than adults living in neighborhoods without sidewalks? A summary table of the significance of association between outcome variables and location is presented at the end of this section.

Research sub question #1:

Do sidewalks in residential neighborhoods encourage physical activity (walking) by adult residents of the neighborhood?

Research sub question #1 was answered by responses to three questions on the study survey. The three survey questions asked survey participant's 1) *favorite exercise*, 2) *exercise actually engaged in*, and 3) *reason for not exercising*.

Favorite exercise

The survey question regarding *favorite exercise* was answered by all 162 study participants. Table 4.6 below displays frequency statistics for seven categories of *favorite exercise*, including decision to exercise. Almost two thirds, 62.8%, of the ward with sidewalks, and half, 50%, of the ward without sidewalks choose *walking* as their favorite exercise. The next favorite exercise choice was *biking*, chosen by 12.8% of the ward with sidewalks and 15.5% of

the ward without sidewalks. *Organized sports programs* offered by the local YMCA or Parks & Rec was chosen as a favorite exercise by 5.1% of the ward with sidewalks, and 9.5% of the ward without sidewalks. The other exercise choices, *running* or *jogging*, *lifting weights*, and *Pilates* or *yoga* were chosen as a favorite exercise by 1.3% to 6.4% of survey participants. Regarding decision to exercise, *Nothing – don't exercise*, was selected by 6.4% of survey respondents from ward 2 with sidewalks, and 16.7% of respondents from ward 3, the ward without sidewalks.

Table 4.6 Count (n), percent (%) favorite exercise by location

Location		Walking	Running or Jogging	Lift Weights	Bike outdoors, stationary bike indoors	YMCA or Parks & Rec programs	Pilates or Yoga	Nothing	Total
Ward 2 (sidewalks)	Count (n)	49	5	4	10	4	1	5	78
	Percent (%)	62.8%	6.4%	5.1%	12.8%	5.1%	1.3%	6.4%	100.0%
Ward 3 (no sidewalks)	Count (n)	42	2	1	13	8	4	14	84
	Percent (%)	50.0%	2.4%	1.2%	15.5%	9.5%	4.8%	16.7%	100.0%
Totals (Ward 2+Ward 3)	Count (n)	91	7	5	23	12	5	19	162
	Percent (%)	56.2%	4.3%	3.1%	14.2%	7.4%	3.1%	11.7%	100.0%

A test of independence, Spearman's rank order correlation, found choice of *favorite exercise* was associated with place of residence. Spearman's rho rank order correlation ($r = .186$, $n = 162$, $p\text{-value} = .018 < .05$), Mann-Whitney U ($U = 2638$, $Z = -2.365$, $r = Z/\sqrt{162} = -.086$, $p = .018 < .05$) and Kruskal-Wallis ($X^2(1) = 5.593$, $p = .018 < .05$) all produced the same statistical conclusion, *favorite exercise* was dependent on place of residence. There was only a 1.8% chance the results occurred by random chance. In other words, whether a residential neighborhood had sidewalks or did not have sidewalks influenced choice of *favorite exercise*, including decision to exercise, of residents of the neighborhood.

Two results were of special interest. Displayed in the highlighted numbers in frequency table 4.6 above and displayed in figure 4.4 below, *walking* was by far the favorite exercise for both wards, although with far less frequency for ward 3 without sidewalks than for ward 2 with sidewalks. More importantly, *nothing – don't exercise*, displayed in table 4.6 above and the bars

to the far right in each set of bars in figure 4.4 below, was chosen with greater frequency by the respondents from ward 3, the ward without sidewalks, than ward 2, the ward with sidewalks.

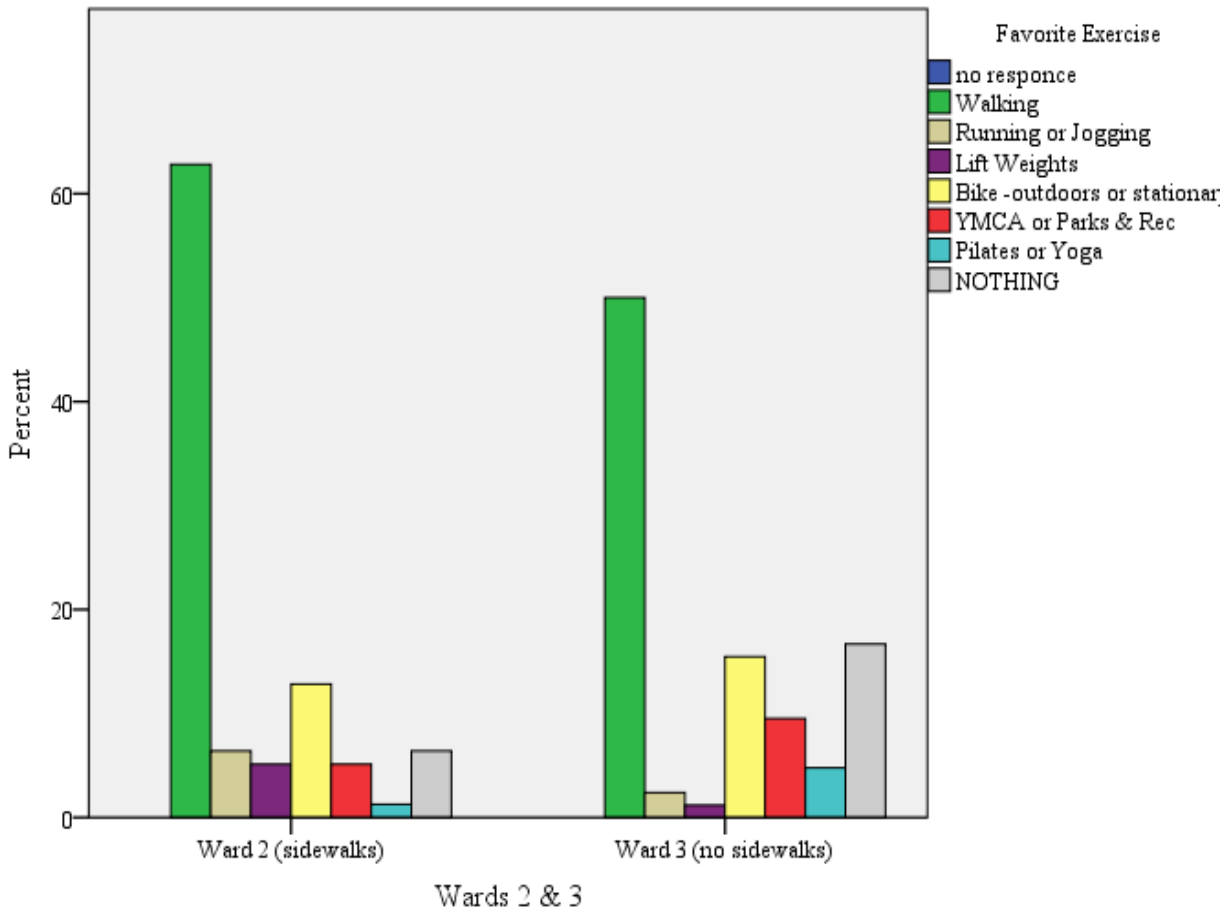


Figure 4.4 Favorite exercise by place of residence (ward)

An additional chi-square test for independence was used to determine if favorite exercise, walking, was associated with survey respondents' gender, age, or income. As presented earlier, residents of ward 2, the ward with sidewalks, indicated walking was their favorite exercise far more than residents of ward 3, the ward without sidewalks, 62.8% and 50.0%, respectively. An individual's favorite, most enjoyed exercise, especially when engaged in outdoors, is likely to become part of a lifelong exercise routine (Duvall, 2011; Focht, 2009). Because lifelong engagement in exercise is key to reducing costly chronic disease, a chi-square test for independence was used to determine if walking was associated with survey respondents' gender,

age, or income. The variables age and income were both collapsed into two category variables for use in 2 by 2 tables in chi-square tests for independence. Gender was already a two category variable, male and female. The categories of the age variable were reduced to less than fifty years old and fifty years old and older. The categories of the income variable were reduced to less than \$40,000 per year and \$40,000 per year and higher.

Chi-square test for independence found favorite exercise, walking, was associated with survey respondents' gender, but not age, or income. Refer to table 4.7 below.

Table 4.7 Significance of association: Walking & reduced variables, gender, age, & income

<i>Walking X Reduced Variable</i>	<i>N</i>	<i>p-value</i>	<i>Significance</i>
<i>Gender (female & male)</i>	<i>160</i>	<i>.010</i>	<i>p < .05*</i>
<i>Age (under 50 & 50 and over)</i>	<i>160</i>	<i>.118</i>	<i>p > .05</i>
<i>Income (<\$40,000 & => \$40,000)</i>	<i>139</i>	<i>.815</i>	<i>p > .05</i>
<i>*Significant at the 0.05 level</i>			

Differences were found in walking between genders (male and female). A chi-square test for independence ($X^2(1, n = 160) = .205, p = .010 < .05$) found the result was statistically significance. The p value of .010 was smaller than an alpha value of .05, therefore choice of walking as a favorite exercise was not independent of gender.

A statistical test for independence found walking was not associated with the two age groups, less than fifty years old and fifty years old and older. A chi-square test for independence ($X^2(1, n = 160) = .118, p = .186 > .05$), found it's p value was .118, which was larger than the alpha value of .05. Therefore, decision to walk was not associated with the two age groups. Another chi-square test for independence ($X^2(1, n = 138) = .035, p = .815 > .05$) found walking was not associated with income. The p value of .815 is larger than the alpha value of .05, therefore decision to walk was not associated with the two income groups, under \$40,000 per year and \$40,000 per year and higher.

The nineteen survey respondents who answered the question regarding *favorite exercise* by selecting the response *nothing –don’t exercise* were instructed to skip the remaining exercise questions and go to the final survey question to respond to why they did not exercise.

Exercise actually engaged in most often (not necessarily favorite exercise)

The survey question *exercise actually engaged in most often, not necessarily favorite exercise* was directed to all survey respondents who had indicated in the previous question that they did engage in exercise. The purpose of the question was to identify the exercise most likely performed by individuals who actually did engage in exercise and test if their exercise choice was independent of residency in a neighborhood with sidewalks or without sidewalks. The question was answered by 144 survey participants, 73 from ward 2, the ward with sidewalks and 71 from ward 3, the ward without sidewalks.

Table 4.8 below displays the frequency statistics for responses of survey respondents regarding the exercise they engaged in most often even if it was not their favorite exercise.

Table 4.8 Count (n), percent (%) exercise engaged in most often by location

Location		Walking	Running or Jogging	Lift Weights	Bike outdoors, stationary bike indoors	YMCA or Parks & Rec programs	Pilates or Yoga	Total
Ward 2	Count (n)	54	6	2	6	5	0	73
(sidewalks)	Percent (%)	74.0%	8.2%	2.7%	8.2%	6.8%	0.0%	100%
Ward 3	Count (n)	51	0	2	10	6	2	71
(no sidewalks)	Percent (%)	71.8%	0.0%	2.8%	14.1%	8.5%	2.8%	100%
Totals	Count (n)	105	6	4	16	11	2	144
(Ward 2+Ward 3)	Percent (%)	72.9%	4.2%	2.8%	11.1%	7.6%	1.4%	100%

When those individuals who did not exercise were not included in the results, 74.0 %, of the survey respondents from ward 2, the ward with sidewalks, choose *walking* as the exercise they engaged in most often, and 71.8 % of survey respondents from ward 3, the ward without sidewalks, also choose *walking* as the exercise they engaged in most often. Biking was the next

exercise chosen by respondents from both wards as the exercise they engaged in most often, but with far less frequency than walking. Only 8.2% of the residents of the ward with sidewalks and 14.1% of the ward without sidewalks chose *biking* as the exercise they engaged in most often.

Organized sports programs offered by the local YMCA or Parks & Rec was chosen as the exercise engaged in most often by 6.8% of the ward with sidewalks, and 8.5% of the ward without sidewalks. Notably, *running* or *jogging* was chosen as a favorite exercise by 8.2 % of the respondents from the ward with sidewalks and 0% of the ward without sidewalks. *Lifting weights*, and *Pilates* or *yoga* were chosen by only 0% to 2.8% of survey participants from both wards.

Analysis using Spearman's rho rank order correlation ($r = .054$, $n = 144$, $p\text{-value} = .520 > .05$), found exercise actually engaged in most often was independent of place of residence. Although no statistically significant relationship was found, the question elicited many written comments by respondents on their completed and returned surveys indicating displeasure regarding the absence of sidewalks in some residential neighborhoods. Because the survey was seeking quantitative data, with no space given for written comments, respondents wrote in the margins and between the lines of the questions on their surveys. See Appendix I for examples.

Notes written on returned surveys indicated survey respondents had safety concerns and trepidation when people walked on streets used for vehicular traffic. The following is a representative sample of the comments written on completed and returned surveys.

Ward 2, with sidewalks: If there are no sidewalks, people here walk in the streets. I have always wished for bike/walking path along O street near the Catholic Church out to along Spring Valley Road. Many people walk and bike along there. The shoulder is narrow and uneven, not safe. Both Waldorf and Forest City students run along that route. All of the other bike/walking trails are east of Hwy 69 but much of the Forest City population lives west of Hwy 69. There definitely needs to be a sidewalk or bike path along John K. Hanson Dr. so kids going to the aquatic center do not have to walk/bike in the street – very dangerous especially during high Winnebago (Industries) traffic times.

Ward 3, without sidewalks: YMCA is close by (uses the YMCA indoor walking track). If we didn't have that then I would walk in the streets. If our neighborhood had sidewalks, I'd walk on the sidewalks. (I) walk around the neighborhood in the street sometimes. The city used to paint a sidewalk line in the street but gave that up a number of years ago.

Ward 2, with sidewalks: There were places I couldn't walk to when my children were young since I didn't want them walking, biking, or in a stroller on the road.

Ward 2, with sidewalks: Sidewalks are lacking in Forest City, O Street for example. Handicapped access is crummy throughout Forest City sidewalks.

As indicated in their written notes, when survey respondents walk on the streets where sidewalks do not exist, or see others walking on streets, they worry about safety for themselves and others who use the streets for walking. Several respondents noted a special concern for the safety of children who walk to school as well as children and adults who walk to various recreational facilities such as the Forest City Aquatic Center.

Reason for no exercise or occasionally skipping a day

This question, *reason for no exercise or occasionally skipping a day*, was answered by 140 study participants, 63 from ward 2 with sidewalks, and 77 from ward 3 without sidewalks. As displayed in table 4.9 below, the reason most selected for not exercising or skipping a day by survey respondents from both wards was *lack of time*, selected by 68.3% of the ward with sidewalks and 53.2% of the ward without sidewalks. The next most frequently selected reason was *not interested* in exercising, selected by 25.4% of the ward with sidewalks and 29.9% of the ward without sidewalks. The answer, *no sidewalks*, was selected by 1.6% of the survey respondents from the ward with sidewalks, and 11.7% of the respondents from the ward without sidewalks. *Can't afford YMCA or health club dues and/or can't afford equipment* was selected by 4.8% and 5.2% of the respondents from the ward with and without sidewalks, respectively.

Table 4.9 Count (n), percent (%) reason for not engaging in exercise by location

<i>Location</i>	<i>Count, Percent</i>	<i>No sidewalks</i>	<i>Lack of time</i>	<i>Not interested or disabled</i>	<i>Can't afford Y dues</i>	<i>Total</i>
<i>Ward 2 (sidewalks)</i>	<i>Count (n)</i>	1	43	16	3	63
	<i>Percent (%)</i>	1.6%	68.3%	25.4%	4.8%	100.0%
<i>Ward 3 (no sidewalks)</i>	<i>Count (n)</i>	9	41	23	4	77
	<i>Percent (%)</i>	11.7%	53.2%	29.9%	5.2%	100.0%
<i>Totals (Ward 2 + Ward 3)</i>	<i>Count (n)</i>	10	84	39	7	140
	<i>Percent (%)</i>	7.1%	60.0%	27.9%	5.0%	100.0%

Analysis using Spearman's rho rank order correlation did not indicate a statistically significant relationship existed between the two variables, residency in either ward 2 with sidewalks or ward 3 without sidewalks, and reason for not exercising or skipping a day. Spearman's rho rank order correlation ($r = -.023$, $n = 140$, $p\text{-value} = .787 > .05$), found reason for not exercising or skipping a day and place of residence had an independent relationship.

Several survey respondents wrote notes in white space on the survey alongside the question *If you don't exercise, or if you skip a day, what is your reason?* All were from ward 3, the ward without sidewalks, and all who wrote notes indicated no sidewalks was among their reasons for not exercising. Examples of notes written on surveys are displayed below.

Ward 3, without sidewalks: I like to walk outdoors. (The individual indicates she sometimes walks in the YMCA because there are no sidewalks in ward 3.)

Ward 3, without sidewalks: all of them (survey respondent circled no sidewalks, lack of time, not interested, can't afford YMCA or health club dues or equipment).

Ward 3, without sidewalks: survey respondent checked both no sidewalks and lack of time and wrote "Equally both"

Research question #2:

Do adults living in residential neighborhoods with sidewalks engage in more regular exercise, five days a week or more, than adults living in neighborhoods without sidewalks?

Research sub question #2 was answered by two survey questions, 1) *if you exercise, how many times do you exercise in a typical week?* and 2) *when you exercise, how much time do you usually exercise?* Survey respondents who choose *nothing – I don't exercise* as their favorite exercise were instructed to skip these two questions regarding exercise.

If you exercise, how many times do you exercise in a typical week?

The survey question regarding *how many times do you exercise in a typical week* was answered by 141 study participants, 72 from ward 2 with sidewalks, and 69 from ward 3 without sidewalks. Survey respondents were asked to choose from the following list, *1 or 2 days each week, 3 or 4 days each week, or 5 or more days each week.*

According to the frequency statistics, displayed in table 4.10 below, 30.6% of survey respondents from the ward with sidewalks exercised *1 to 2 days a week*, and 37.7% of survey respondents from the ward without sidewalks exercised *1 to 2 days a week*. In the *3 to 4 days each week* category, 34.7% of survey respondents from the ward with sidewalks exercised *3 to 4 days each week*, and 39.1% of survey respondents from the ward without sidewalks exercised *3 to 4 days a week*. In the all-important *5 days a week or more* category, 34.7% of survey respondents from ward 2 with sidewalks exercised *5 or more days per week*, and 23.2% of survey respondents from ward 3 without sidewalks exercised *5 or more days per week*.

Table 4.10 Count (n), percent (%) number of days per week engaged in exercise

<i>Location</i>	<i>Count, Percent</i>	<i>1 to 2 days</i>	<i>3 to 4 days</i>	<i>5 or more days</i>	<i>Total</i>
<i>Ward 2 (sidewalks)</i>	<i>Count (n)</i>	22	25	25	72
	<i>Percent (%)</i>	30.6%	34.7%	34.7%	100.0%
<i>Ward 3 (no sidewalks)</i>	<i>Count (n)</i>	26	27	16	69
	<i>Percent (%)</i>	37.7%	39.1%	23.2%	100.0%
<i>Totals (Ward 2 + Ward 3)</i>	<i>Count (n)</i>	48	52	41	141
	<i>Percent (%)</i>	34.0%	36.9%	29.1%	100.0%

The goal for optimal health is to engage in some form of exercise at least five or more days per week. Therefore, the most important category in the response list was *5 or more days*

per week. As shown in table 4.10 above, ward 2, the ward with sidewalks, had a greater number of individuals in the *5 or more days* a week category than ward 3, the ward without sidewalks.

Although there was a difference in the distribution of the data between the two wards, the results of statistical analysis using Spearman's rho rank order correlation ($r = -.116$, $n = 141$, $p\text{-value} = .169 > .05$), did not indicate a statistically significant relationship existed. There was no association between the two variables, place of residence (ward) and days spent in exercise. Lack of statistical significance indicates the differences which existed may be the result of chance. Hence, although there were differences, statistical analysis indicated place of residence, in ward 2 or ward 3, was not associated with the number of days residents exercised.

When you exercise, how much time do you usually exercise?

The survey question *when you exercise, how much time do you usually exercise* was answered by 141 study participants, 72 from ward 2, the ward with sidewalks, and 69 from ward 3, the ward without sidewalks. Survey participants were asked to choose from the following list, *less than 15 minutes, 15 to 60 minutes, or 60 minutes (1 hour) or more*.

As displayed in table 4.11 below, 12.5% of survey respondents from the ward with sidewalks, ward 2, exercised for *less than 15 minutes* each session when they exercised, compared to 5.8% of the ward without sidewalks, ward 3, for the same time category. Most survey participants exercised between 15 to 60 minutes per exercise session. Of ward 2 survey respondents, 66.7% exercised *15 to 60 minutes each session* compared to 76.8% of ward 3 survey respondents. In the *hour or more* category, 20.8% of ward 2 survey respondents exercised 1 hour or more each session compared to 17.4% of ward 3 survey respondents.

Table 4.11 Count (n), percent (%) time spent in exercise per session by location

<i>Location</i>	<i>Count, Percent</i>	<i>Less than 15 minutes</i>	<i>15 to 60 minutes</i>	<i>More than 1 hour</i>	<i>Totals</i>
<i>Ward 2 (sidewalks)</i>	<i>Count (n)</i>	9	48	15	72
	<i>Percent (%)</i>	12.5%	66.7%	20.8%	100.0%
<i>Ward 3 (no sidewalks)</i>	<i>Count (n)</i>	4	53	12	69
	<i>Percent (%)</i>	5.8%	76.8%	17.4%	100.0%
<i>Totals (Ward 2 + Ward 3)</i>	<i>Count (n)</i>	13	101	27	141
	<i>Percent (%)</i>	9.2%	71.6%	19.1%	100.0%

The results for both wards appeared to be similar. Analysis using Spearman's rho rank order correlation ($r = .025$, $n = 141$, $p\text{-value} = .767 > .05$), confirmed there was no statistically significant relationship between the two variables, place of residence and time spent per exercise session. Time spent per exercise session and place of residence had an independent relationship.

Research sub question #3:

Do adults living in residential neighborhoods with sidewalks indicate higher levels of perceived good-to-excellent health than adults living in neighborhoods without sidewalks?

Research sub question #3 was answered by one survey questions, *How is your health?*

How is your health?

The survey question *How is your health?* was answered by 157 study participants, 76 from ward 2 with sidewalks, and 81 from ward 3 without sidewalks. Study participants were directed to choose one of five possible choices of health status, *very poor*, *poor health*, *average for my age*, *good*, or *excellent health*. The survey results were similar for both wards.

Compilation of survey answers are presented in table 4.12 below. The category, *excellent health*, was chosen by 18.4% of ward 2, and 19.8% of ward 3 survey respondents. The greatest number of survey respondents, 44.7%, of ward 2, the ward with sidewalks, and 51.9%, from ward 3, the ward without sidewalks, choose *good* as their perceived health status. *Average health* was selected by 27.6% of ward 2 survey respondents, and 24.7% of ward 3 survey respondents.

Poor health was selected by 7.9% of ward 2, and 2.5% of ward 3 survey respondents. *Very poor* health was chosen by only two survey respondents, one from each ward.

Table 4.12 Count (n), percent (%) self-perceived health by location

Location		Very Poor	Poor Health	Average	Good	Excellent	Total
Ward 2 (sidewalks)	Count (n)	1	6	21	34	14	76
	Percent (%)	1.3%	7.9%	27.6%	44.7%	18.4%	100.0%
Ward 3 (no sidewalks)	Count (n)	1	2	20	42	16	81
	Percent (%)	1.2%	2.5%	24.7%	51.9%	19.8%	100.0%
Totals	Count (n)	2	8	41	76	30	157
(Ward 2+Ward 3)	Percent (%)	1.3%	5.1%	26.1%	48.4%	19.1%	100.0%

A boxplot of the data presented in figure 4.5 below, shows the categories selected by survey respondents were very similar, primarily *average* and *good* self-perceived health status.

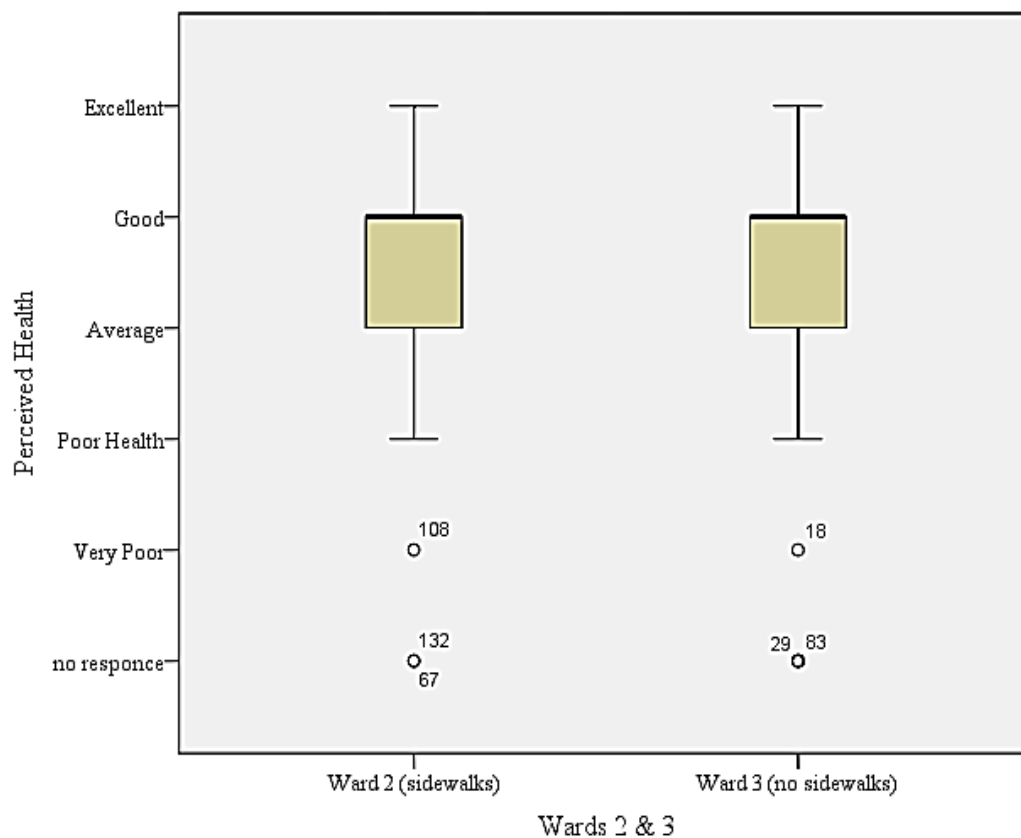


Figure 4.5 Self-perceived health by place of residence (ward)

There was one individual from each ward that were identified as outliers by SPSS because of no response. Also, *very poor health* was selected by one respondent from each ward,

ID #108 from ward 2, and ID #18 from ward 3. The outliers did not affect statistical analysis. The identical length of each box is the interquartile range and represents 50% of cases for each ward (Pallant, 2016). Results of analysis of the relationship between place of residence and perceived health status did not indicate a statistically significant relationship between the two variables, perceived health and place of residence in ward 2 with sidewalks or ward 3 without sidewalks. Spearman's rho rank order correlation ($r = .083$, $n = 157$, $p\text{-value} = .30 > .05$) produced the statistical conclusion, perceived health and place of residence had an independent relationship.

Research sub question #4:

Do adults living in residential neighborhoods with sidewalks consume healthier foods than adults living in neighborhoods without sidewalks?

Research sub question #4 was answered by the survey question regarding *Food Choices*:
In a typical week, how many times do you eat the following?

Food choices

This survey question regarding *food choices* was answered by 161 survey respondents. Survey participants were presented with seven categories of foods, four categories of healthy foods and three categories of unhealthy foods. The healthy food categories were 1) *vitamins or supplements*, 2) *fresh fruits and vegetables OR frozen-fresh*, 3) *protein-meat, fish, eggs, beans, cheese*, and 4) *whole grain bread or whole grain cereal*. The unhealthy food categories were 1) *store-bought TV dinners (frozen dinners)*, 2) *canned vegetables (store-bought in tin cans)*, and 3) *junk foods (Hostess cupcakes, chips, sugar coated cereals, etc.)*.

For each type or category of healthy food, survey respondents were directed to check one of the four possible choices regarding how many times each week they ate foods from the

category. For the healthy foods category, the answer choices were *never*, which was recorded as 1 point, *not too often*, recorded as 2 points, *several times a week*, recorded as 3 points, or *every day*, recorded as 4 points. The unhealthy food choices were reversed coded, *never*, which was recorded as 4 point, *not too often*, recorded as 3 points, *several times a week*, recorded as 2 points, or *every day*, recorded as 1 point. Each survey respondent's food choices were summed for one continuous variable, Healthy Food Choices. See Appendix H for a coding example.

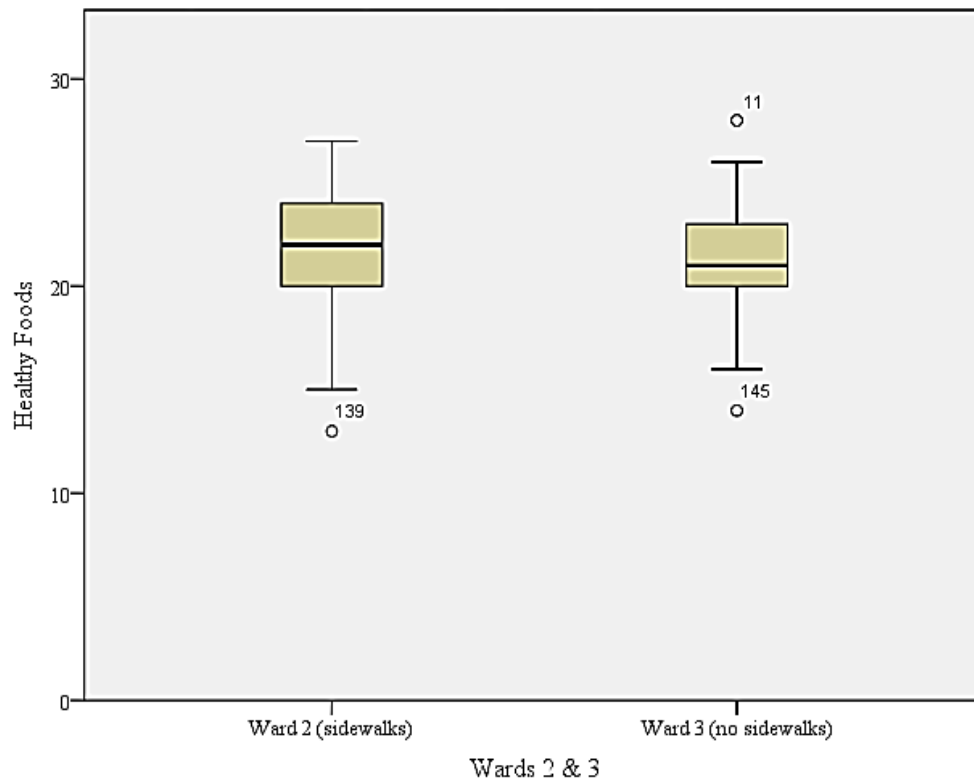


Figure 4.6 Healthy foods consumption by place of residence (ward)

The distribution of the scores for Healthy Food Choices for both ward 2 and ward 3 can be viewed in the boxplot in figure 4.6 above. The length of each box is the variable's interquartile range, representing 50% of cases for each ward (Pallant, 2016). As indicated by the size of the boxes, ward 3, the ward without sidewalks has a smaller box, less range of values, with a greater concentration of cases around the median, which is lower than ward 2, the ward

with sidewalks. SPSS software used in this analysis identified 3 outliers. Two for ward 3, ID #11, a high outlier, and ID # 145, a low outlier. Ward 2 had only one outlier, ID # 139, with a low score. Outliers can skew results of statistical analysis, primarily the mean and standard deviation, but not the median value, especially of a large data set with 161 data points. Therefore, these outliers had no effect on the data analysis.

The median value was slightly lower for ward 3, the ward without sidewalks, indicating slightly less healthy food consumption than ward 2, the ward with sidewalks. However, analysis using Pearson's product-moment correlation did not indicate a statistically significant relationship between the two variables, place of residence and food choices. Results of statistical analysis indicate place of residence and food choices had an independent relationship (Pearson's $r = .000$, $n = 162$, $p\text{-value} = .997 > .05$), which suggests the small difference in food choices may have occurred by chance.

An independent sample t-test produced the same statistical conclusion, no statistically significant relationship existed between the two variables, food choices and place of residence in ward 2 or ward 3. The p -value of the Laverne's test was not significant, $p = .363 > \alpha$. Therefore, equal variances were assumed. There was no significant difference in scores for ward 2 ($M = 21.53$, $SD = 2.864$) and ward 3 ($M = 21.52$, $SD = 2.558$); $t(160) = .004$, $p = .997$ (2-tailed). Although ward 3 had a slightly lower mean, the magnitude of the difference in means was very small, (Mean difference = .002, 95% CI: -.839 to .843). Thus, food choices were found to be independent of place of residence for participants in this survey.

Summary: Significance of Association Between Location and Outcome Variables

Table 4.13 below displays a summary of results of the statistical tests. The results displayed are Spearman's rho and Pearson's r , which were used to look for an association between the outcome variables and place of residence.

Table 4.13 Significance of association between location and outcome variables

<i>Statistical test</i>	<i>Location X Variable</i>	<i>n</i>	<i>r</i>	<i>p-value</i>
<i>Spearman's rho</i>	<i>Favorite exercise</i>	162	.186	.018*
<i>Spearman's rho</i>	<i>Exercise actually performed</i>	144	.054	.520
<i>Spearman's rho</i>	<i>Reason for not exercising</i>	140	-.023	.787
<i>Spearman's rho</i>	<i>Exercise: days per week</i>	141	-.116	.169
<i>Spearman's rho</i>	<i>Time spent per session</i>	141	.025	.767
<i>Spearman's rho</i>	<i>Self-perceived health status</i>	157	.083	.300
<i>Pearson's r</i>	<i>Healthy food choices</i>	162	.000	.997
*Significant at the 0.05 level				

As shown in table 4.13 above, only survey respondents' responses for *favorite exercise*, which included decision to exercise, were found to be associated with location of residence, using Spearman's rho rank order correlation ($r = .186$, $n = 162$, $p\text{-value} = .018 < .05$). All other outcome variables were found to be independent of location of residence.

Survey Results Summary

The survey in this study was based on a comparison of two groups of individuals who were residents of two adjacent residential, working class, neighborhoods. The two separate neighborhoods represented two adjacent voting prescient wards, ward 2 with sidewalks, and ward 3 without sidewalks, in Forest City, Iowa. Housing in the ward 3 without sidewalks was constructed in the early 1970s to accommodate the influx of individuals who relocated to Forest City from distant communities to work in Winnebago Industries, manufacturer of recreational vehicles. Of current Forest City adults in the workforce, 38% are employed in manufacturing, primarily in Winnebago Industries (State Data Center, 2017; Winnebago Industries, Inc., 2018). The purpose of the survey was to gather data regarding exercise routines, food choices, and self-perceived health status of two groups of individuals who were assumed to differ only by location of residence. Therefore, it was important to analyze the demographic variables, gender, age, and income of the survey participants to ascertain independence of residency in ward 2 with sidewalks, or ward 3 without sidewalks. Responses to demographic questions on the study

survey indicate the two wards, one with sidewalks and one without sidewalks, had no statistically significant differences in demographic data, allowing comparison of the effects of sidewalks on exercise activities, food choices, and self-perceived health status of residents of the two working class neighborhoods.

Survey results indicated *favorite exercise* as well as decision to exercise was associated with place of residence, $p < .05$ level of significance, indicating residency in a neighborhood with sidewalks or without sidewalks effects residents' decision to exercise and choice of favorite exercise. No other outcome variables (exercise actually performed, reason for not exercising, number of days per week engaged in exercise, time spent per exercise session, self-perceived health status, and healthy food choice) were found to be associated with location of residence. Table 4.14 below displays a summary of the statistical analysis of association between location of residence and all variables, demographic variables and outcome variables.

Summary: Significance of Association Between All Variables and Location

Table 4.14 Summary: Statistical association between location and all variables

<i>Statistical test</i>	<i>Location X Variable</i>	<i>n</i>	<i>r</i>	<i>p-value</i>
<i>Chi-square</i>	<i>Gender</i>	160		.801
<i>Chi-square</i>	<i>Age</i>	160		.300
<i>Chi-square</i>	<i>Income</i>	138		.830
<i>Spearman's rho</i>	<i>Favorite exercise</i>	162	.186	.018*
<i>Spearman's rho</i>	<i>Exercise actually performed</i>	144	.054	.520
<i>Spearman's rho</i>	<i>Reason for not exercising</i>	140	-.023	.787
<i>Spearman's rho</i>	<i>Exercise: days per week</i>	141	-.116	.169
<i>Spearman's rho</i>	<i>Time spent per session</i>	141	.025	.767
<i>Spearman's rho</i>	<i>Self-perceived health status</i>	157	.083	.300
<i>Pearson's r</i>	<i>Healthy food choices</i>	162	.000	.997

*Significant at the 0.05 level

Survey results from the question regarding *favorite exercise* provided information regarding *decision to engage in exercise* which is of upmost importance to communities engaged in efforts to promote community physical activity/exercise. Analysis of survey data found sidewalks were associated with type of exercise favored as well as the decision to engage in

exercise by residents of the two neighborhoods. Residents of ward 2, the ward with sidewalks, indicated *walking* was their *favorite exercise* far more than residents of ward 3, the ward without sidewalks, 62.8% and 50.0%, respectively. The results are displayed in the frequency data in table 4.15 below. Because an enjoyed, favorite exercise is likely to be continued (Duvall, 2011; Focht, 2009), more residents of ward 2 with sidewalks will likely continue their favored exercise, walking, as part of a continuous, lifelong exercise routine than residents of ward 3, the ward without sidewalks.

Table 4.15 Count (n), percent (%) favorite exercise by location

Location		Walking	Running or Jogging	Lift Weights	Bike outdoors, stationary bike indoors	YMCA or Parks & Rec programs	Pilates or Yoga	Nothing	Total
Ward 2 (sidewalks)	Count (n)	49	5	4	10	4	1	5	78
	Percent (%)	62.8%	6.4%	5.1%	12.8%	5.1%	1.3%	6.4%	100.0%
Ward 3 (no sidewalks)	Count (n)	42	2	1	13	8	4	14	84
	Percent (%)	50.0%	2.4%	1.2%	15.5%	9.5%	4.8%	16.7%	100.0%
Totals (Ward 2+Ward 3)	Count (n)	91	7	5	23	12	5	19	162
	Percent (%)	56.2%	4.3%	3.1%	14.2%	7.4%	3.1%	11.7%	100.0%

More importantly, only 6.4% of respondents from ward 2 with sidewalks, indicated they *did nothing, no exercise*, while 16.7% of respondents from ward 3 without sidewalks, indicated they *did nothing, no exercise*. These results indicate a significant number of residents of ward 3, without sidewalks, might eventually not engage in exercise at all, which appears to have already happened. At the point in time of the survey, as indicated by frequency statistics in table 4.15 above, more survey respondents from the ward without sidewalks said they *did nothing – don't exercise*, then respondents from the ward with sidewalks.

An additional chi-square test for independence was used to determine if favorite exercise, walking, was associated with survey respondents' gender, age, or income. The variables age and income were both collapsed into two category variables. Gender was already a two category variable, male and female. The categories of the age variable became less than fifty years old and

fifty years old and older. The categories of the income variable became less than \$40,000 per year and \$40,000 per year and higher. Chi-square test for independence results are summarized in table 4.16 below.

Table 4.16 Significance of association: Walking & reduced variables, gender, age, income

<i>Walking X Variable</i>	<i>N</i>	<i>p-value</i>	<i>Significance</i>
<i>Gender (female & male)</i>	<i>160</i>	<i>.010</i>	<i>p < .05*</i>
<i>Age (under 50 & 50 and over)</i>	<i>160</i>	<i>.118</i>	<i>p > .05</i>
<i>Income (<40,000 & =>40,000)</i>	<i>139</i>	<i>.815</i>	<i>p > .05</i>
<i>*Significant at the 0.05 level</i>			

The results indicate favorite exercise, walking was associated with gender, but not age or income. The importance of the results lies in the longevity statistics that indicate women live longer than men and have far more costly medical histories. Alemayehu and Warner (2004) report women's per capita lifetime healthcare costs were 30% higher than men's per capita healthcare costs due to women having a longer lifespan than men. Thus, women especially would benefit from walkable built environments that would allow them to begin a walking-for-exercise regimen at an early age and continue throughout their life.

CHAPTER 5. DISCUSSION

Overview

Public health officials refer to obesity in the U.S. as an epidemic. All regions of the U.S. report more than 25% of their residents are beyond just overweight, they are obese, with some regions reporting far higher obesity rates than others. While the rates of obesity in the West are reported at 26.1% and in the Northeast at 27.7%, the Midwest reports 32.3% of adults in the region are obese and the South reports 32.4% of the adults in that region are obese. In seven states located within the Midwest and South (Alabama, Arkansas, Iowa, Louisiana, Mississippi, Oklahoma, and West Virginia), over 35% of the adults are obese (CDC, 2019). The high rates of overweight and obesity in adults in the U.S. and associated poor health and escalating health care costs create concern for individuals and their communities, especially in the Midwest and the Southern regions.

Overweight and obesity is nearly always caused by poor eating habits and little regular exercise. Cumulative negative effects of life-long unhealthy eating habits and little regular exercise intensify as people reach age fifty and costly chronic disease begins to manifest. Major implications for communities are 1) the projected population trends indicate the percent of people over age fifty will continue to increase every year, and 2) there will be an increasingly greater percent of community residents and workers in the workforce over fifty years old of age, resulting in high health care and insurance costs for individuals and increasingly higher insurance costs for local employers (CDC, 2015; Kaiser Family Foundation, 2015; Manson & Bassuk, 2003; Stanton & Rutherford, 2006). Because overweight and obesity, and resultant chronic disease, are usually the result of an unhealthy diet and too little exercise, it behooves communities, especially the rural communities of the Midwest and South, to investigate ways

community built environments can promote healthy lifestyles and most importantly, provide easy access to daily physical activity/exercise.

The Study

This study took place in a rural community, Forest City, population 4,151, in Iowa, one of the seven states with the highest rates of obesity in the nation. The study used a natural experiment to investigate the relationship between an element of the built environment, sidewalks, and engagement in physical activity/exercise and self-perceived health status of adults living in residential working class neighborhoods in two adjacent voter precinct wards in Forest City. One neighborhood/ward had sidewalks and the other neighborhood/ward did not have sidewalks. Housing in the neighborhood without sidewalks was constructed in the early 1970s to accommodate the influx of individuals who relocated to Forest City from distant communities to work in Winnebago Industries, manufacturer of recreational vehicles. Of current Forest City adults in the workforce, 38% are employed in manufacturing, primarily in Winnebago Industries (American FactFinder, 2018; State Data Center, 2017; Winnebago Industries, Inc., 2018).

The **general theory** guiding the study was *physical activity promotes healthy lifestyles*. The **research question** that drove the study was *How can community development initiatives promote rural, residential built environments that help combat obesity?* The research sub questions for this study were formulated with intent of finding whether an element of the residential built environment (sidewalks) promotes healthier lifestyles. The survey-based research presented in this paper answered the following **research sub questions**: Do sidewalks in residential neighborhoods encourage physical activity/exercise by adult residents of the neighborhood? Do adults living in residential neighborhoods with sidewalks record more hours of exercise per week than adults living in residential neighborhoods without sidewalks? Do

adults living in residential neighborhoods with sidewalks indicate better health than adults living in residential neighborhoods without sidewalks? Do adults living in residential neighborhoods with sidewalks consume healthier foods than adults living in neighborhoods without sidewalks?

The study employed a survey to gain information regarding a population represented by two adjacent residential working class neighborhoods/wards in Forest City, Iowa. The survey was sent to a random sample of residents in the two adjacent residential neighborhoods/wards, ward 2 with sidewalks and ward 3 without sidewalks. There were 404 surveys successfully delivered to potential study participants, 203 to ward 2 residents and 201 to ward 3 residents. The number of surveys completed and returned was nearly evenly split between the two wards, 78 (48.1%) from ward 2, and 84 (51.9%) from ward 3, for a total of 162 surveys completed and returned, resulting in an overall 40.1% return rate, considered a good return rate for a simple, mailed survey.

There were three questions on the survey regarding demographic characteristics and seven questions regarding the dependent variables. The dependent variables, the variables potentially influenced by the independent variable, were favorite exercise, exercise actually performed, reason for not exercising, number of days per week engaged in exercise, time spent per session, self-perceived health status, and food choices. The independent variable in the study was the presence or absence of sidewalks in the two adjacent residential neighborhoods/wards.

Findings

The purpose of the survey was to gather data regarding exercise routines and diets of two groups of individuals who were assumed to differ only by location of residence. Therefore, it was important to analyze the demographic variables, gender, age, and income, of survey participants to ascertain the demographic variables were independent of residency in ward 2 with sidewalks or ward 3 without sidewalks. Chi-square test of independence between all

demographic variables and location of residence found demographic characteristics to be independent of location of residence in ward 2 or ward 3. This allowed for a comparison of the two neighborhood/wards survey participants' responses.

Summary: Results of Statistical Analysis of Outcome Variables

Statistical analysis found an association (effect size $r = .186$, $n = 162$, $p = .018 < .05$) between location of residence and favorite exercise. All other dependent variables (exercise actually performed, reason for not exercising, number of days per week engaged in exercise, time spent per exercise session, self-perceived health status, and food choices) had differences in results, but those differences did not rise to the level of statistical significance. Refer to table 5.1 for a summary of statistical analysis of association between location and all outcome variables.

Table 5.1 Summary: Statistical association between location and outcome variables

<i>Statistical test</i>	<i>Location X Variable</i>	<i>n</i>	<i>r</i>	<i>p-value</i>
<i>Spearman's rho</i>	<i>Favorite exercise</i>	<i>162</i>	<i>.186</i>	<i>.018*</i>
<i>Spearman's rho</i>	<i>Exercise actually performed</i>	<i>144</i>	<i>.054</i>	<i>.520</i>
<i>Spearman's rho</i>	<i>Reason for not exercising</i>	<i>140</i>	<i>-.023</i>	<i>.787</i>
<i>Spearman's rho</i>	<i>Exercise: days per week</i>	<i>141</i>	<i>-.116</i>	<i>.169</i>
<i>Spearman's rho</i>	<i>Time spent per session</i>	<i>141</i>	<i>.025</i>	<i>.767</i>
<i>Spearman's rho</i>	<i>Self-perceived health status</i>	<i>157</i>	<i>.083</i>	<i>.300</i>
<i>Pearson's r</i>	<i>Healthy food choices</i>	<i>162</i>	<i>.000</i>	<i>.997</i>
<i>*Significant at the 0.05 level</i>				

Survey results from the question regarding *favorite exercise* provided significant information regarding the **decision to engage in exercise**, which is of upmost importance to communities attempting to increase resident physical activity/exercise. Analysis of survey data found sidewalks were associated with type of exercise favored as well as the **decision to engage in exercise** by residents of the two neighborhoods. Only 6.4% of respondents from ward 2 with sidewalks, indicated they *did nothing, no exercise*, while 16.7% of respondents from ward 3 without sidewalks, indicated they *did nothing, no exercise*. Refer to table 5.2 below.

Table 5.2 Count (n), percent (%) favorite exercise by location

Location		Walking	Running or Jogging	Lift Weights	Bike outdoors, stationary bike indoors	YMCA or Parks & Rec programs	Pilates or Yoga	Nothing	Total
Ward 2	Count (n)	49	5	4	10	4	1	5	78
(sidewalks)	Percent (%)	62.8%	6.4%	5.1%	12.8%	5.1%	1.3%	6.4%	100.0%
Ward 3	Count (n)	42	2	1	13	8	4	14	84
(no sidewalks)	Percent (%)	50.0%	2.4%	1.2%	15.5%	9.5%	4.8%	16.7%	100.0%
Total ward 2 & 3									162

Also, residents of ward 2, the ward with sidewalks, indicated *walking* was their *favorite exercise* far more than residents of ward 3, the ward without sidewalks, 62.8% and 50.0%, respectively. Previous research studies have found an individual's favorite, most enjoyed exercise, especially when engaged in outdoors, is likely to become part of a continued exercise routine (Duvall, 2011; Focht, 2009). The results of this study indicate that residents of ward 2, with sidewalks, are more likely to continue their favorite exercise, walking, as part of a lifelong exercise regimen than residents of ward 3, without sidewalks. Furthermore, results indicate a significant number of residents of the ward without sidewalks, eventually might not engage in exercise at all, which appears to have already happened. At the point in time of the survey, as displayed in frequency statistics in table 5.2 above, more survey respondents from the ward without sidewalks (16.7%) said they did *nothing – don't exercise*, then respondents from the ward with sidewalks (6.4%). An additional chi-square test for independence was used to determine if favorite exercise, walking, was associated with survey respondents' gender, age, or income. The statistical test indicated favorite exercise, walking, was associated with gender, but not age or income. The results of the statistical test are summarized in table 5.3 below.

Table 5.3 Significance of association: Walking & reduced variables, gender, age, & income

Walking X Variable	N	p-value	Significance
Gender (female & male)	160	.010	$p < .05^*$
Age (under 50 & 50 and over)	160	.118	$p > .05$
Income (<40,000 & =>40,000)	139	.815	$p > .05$
*Significant at the 0.05 level			

The importance of the results of table 5.3 lies in the longevity statistics that indicate women live longer than men and have far more costly medical histories. Alemayehu and Warner (2004) report women's per capita lifetime healthcare costs were 30% higher than men's lifetime per capita healthcare costs due to women's longer lifespan. Therefore, women would benefit from walkable built environments that allow them to begin a walking-for-exercise regimen at an early age and continue throughout their lives.

To promote healthy lifestyles that combat obesity and reduce the incidence of chronic disease, communities need to provide exercise opportunities that individuals of any age or income will enjoy. Results of this study indicate providing sidewalks in residential neighborhoods would provide community residents that access to opportunities to engage in exercise by providing access to their favorite daily exercise, walking.

Community Development Initiatives

The research question *How can community development initiatives promote rural, residential built environments that help combat obesity?* can be addressed by community members coming together to take collective action to generate solutions to obesity in their communities. Using the community capitals framework, community members can identify and build on community resources and assets that provide opportunities for healthy lifestyles, including sidewalks for walking in all rural residential neighborhoods, enabling community members to make lifestyle choices that lead to reduced overweight and obesity and reduced incidence of chronic disease.

Rural communities, such as Forest City, Iowa, share the concerns of all Iowans and all of the U.S. with regard to the increasing percent of residents acquiring one or more of the expensive chronic diseases (heart disease, stroke, diabetes, and some cancer) due to too little regular

physical activity and poor eating habits. Chronic disease is associated with huge physiological and financial costs for individuals, ultimately resulting in enormous economic costs to employers in their communities as well.

Economic costs to individuals, employers, and communities include:

- Higher insurance costs and out-of-pocket health care costs for individuals
- Higher insurance costs to employers due to workers' increased medical costs
- Loss of community revenue when residents of small communities commute to, or relocate to, larger nearby communities with regional healthcare facilities, and medical specialists.

Informed community members can mobilize the community capitals (financial, political, social, human, cultural, natural, and built capital) for the purpose of reducing costly chronic disease by establishing a community culture promoting physical activity for people of all ages to improve individual health while decreasing health care and insurance costs, ultimately improving the community's overall economy. Using the community capitals framework, community members can identify and build on the community's resources and assets to provide opportunities for healthy lifestyles, including sidewalks for walking in all rural community residential neighborhoods, enabling community members to make lifestyle choices that lead to decreased overweight and obesity and reduced chronic disease.

The key is building social capital, which reflects the connections among people and organizations. "Building social capital is vital if small communities are to thrive. Bonding social capital includes making multiple connections with individuals and groups together within and outside of a community. Social networks within and outside a community add economic vitality." The result is effective mobilization of the community and its assets resulting in a

healthier ecosystem, social inclusion, and enhanced economic security (Flora & Flora, 2012). Communities can use a strategy focusing on enhancing social capital through people-to-people communication links while promoting community health and wellness with a three-fold objective. Those three-fold objectives are 1) create awareness of the ways in which personal finances and the economy of the community are affected by individual health and wellness, 2) promote an atmosphere that will encourage healthy lifestyles, including daily exercise, and 3) provide an environment that will encourage individuals to voice their opinions to elected officials regarding the need for built environments that support daily exercise.

To promote awareness and build social capital, community residents can come together in casual settings in “community conversations” regarding issues affecting everyone. “Community conversations” involve a series of facilitated dialogues in casual settings, in contrast to conventional approaches in which people are grouped together for awareness-raising lectures (Hardwood, n.d.; Schaffer, Deller, & Marcouiller, 2004). In rural communities, a “conversation” can be an organized, but casual, get-together in a local bar or restaurant, a church community room, or a fitness club at a scheduled time each month. At these informal meetings, community members can build relationships, identify community concerns, explore what needs to be done about those concerns, and make specific decisions regarding what to do. For example, in the location of this study, Forest City, Iowa, the mayor holds scheduled “Meet the Mayor” informal sessions in the comfortable community room in the local YMCA. At these gatherings, the mayor is often the facilitator as town residents meet and greet, discuss the community’s needs and concerns and discuss what course of action to take.

The strategy described above, using a community conversation format, or hybrid, informal but organized meeting, focuses on improving social capital, thereby mobilizing the

community and increasing community capacity (Chaskin, 2001; Goodman et al., 1998). Actions and activities that result in improved community health and lowered health care costs are more likely to occur when communities have powerful people-to-people communication links, which can be developed in community conversations. The final step is community members using their collective voice and influence to promote community land use, development, and zoning policies that support walkable communities.

Policy Recommendations

Characteristics of the built environment affect the health of communities due to how the built environment promotes or discourages physical activity (Diez Roux, 2003; Evans, 2003; Handy et al., 2002; Savitch, 2003). Results from this study suggest presence of sidewalks in residential neighborhoods promotes physical activity and likely would promote healthy lifestyles, improve health, and lower healthcare costs of residents of the neighborhoods. In this study, that favorite exercise was found to be walking. Because an exercise that is enjoyed is likely to be continued and become a favored go-to exercise (Focht, 2009; Duvall, 2011), it is important for communities to create environments that promote that type of favorite exercise.

“The law is a potent tool in creating a built environment that is conducive to public health.” Legislatures design broad policies, parameters, and processes for making decisions that affect the built environment. Their decisions and policies are then carried out and enforced by planning boards, zoning boards, and administrative agencies. The public can effectively influence those legislative decisions, policy, and laws by intervening early in the process, when broad policies are being made about population density, land-use configurations, transportation, and other issues (Perdue et al., 2003). Community development can use its voice, expertise, and

influence to encourage legislatures and agencies to create and enforce laws designed to ensure community environments that promote healthy lifestyles.

As stated in *Step It Up! the Surgeon Generals call to action to promote walking and walkable communities* (HHS, 2015), “Decisions and plans made by the transportation, land use, and community design sector can affect whether communities and streets are designed to support walking. This sector can change the design of communities and streets through roadway design standards, zoning regulations, and building codes and improve the pedestrian experience through landscaping, street furniture, and building design.” The current study found survey respondents’ favorite exercise, walking, as well as the decision to engage in any type of exercise, occurred with greater frequency in residential neighborhoods with sidewalks than in residential neighborhoods without sidewalks. Therefore, to provide a community that promotes physical activity/exercise, especially walking, informed community members can, through the community development process, use their collective expertise and voice to promote land use, development, and zoning policy that requires developers to include residential neighborhood sidewalks in all subdivision planning in small, rural communities before receiving approval for new housing construction.

Limitations and Related Strengths

I found the study had two limitations. First, it was based on a natural experiment, not controlled in the traditional sense. There was no control over extraneous, confounding variables that may have existed in the environment. If extraneous variables are present in a natural experiment, they will bias results of a study to some degree (Craig et al., 2012). Second, because this study was conducted in a small, rural community with a low crime rate (American FactFinder, 2018; State Data Center, 2017), the results likely will not generalize to larger metropolitan residential neighborhoods with higher crime rates.

Despite the limitations, the study had two related strengths. First, because the study was a natural experiment it was possible to study the impact a preexisting element, sidewalks, had on a population. Second, the study took place in Iowa, one of the seven states (Alabama, Arkansas, Iowa, Louisiana, Mississippi, Oklahoma, and West Virginia) with the highest rates of obesity in the United States (CDC, 2019). Because a natural experiment in a rural community was the basis of the study, external validity or generalizability was enhanced with respect to other small, rural communities, the demographic with the greatest rates of obesity in the United States.

Future Research

My research carried forward the investigation into the relationship between an element of the residential neighborhood built environment, sidewalks, and physical activity/exercise. Future research could build on my research and investigate relationships between levels of adult physical activity/exercise and early childhood residency in neighborhoods with sidewalks. The purpose would be to investigate whether very early life experiences associated with sidewalks in residential neighborhoods, first as an infant in a stroller, then riding on a toddler trike, and later perhaps on a skateboard or roller skates, is related to lifelong participation in physical activity/exercise and healthy lifestyle choices.

Future research regarding residential neighborhood built environment effects on level of residents' physical activity/exercise could benefit from using geographic information systems (GIS) software. "GIS is a computer-based tool for the capture, storage, manipulation, analysis, modeling, retrieval and graphic presentation of spatially referenced information. GIS uses databases and software to analyze data by location, revealing hidden patterns, relationships and trends that may not be apparent in spreadsheets or when using the standard statistical packages from epidemiology or the social sciences (Leslie et al., 2007)." GIS can be used when all

environmental variables that restrict physical activity are not readily apparent. For example, even though a sidewalk may be necessary for walking, its existence does not necessarily imply that people will use it. Many design qualities in the built environment impact an individual's decision to walk for transportation or leisure. GIS software can be used to analyze location data and uncover any extraneous, confounding variables that might intervene between the variables that affect environmental walkability (Frank, 2004; Frank & Pivo, 1995; Frank et al., 2003; Handy et al., 2002; McCormack & Shiell, 2011; Neckerman et al., 2009; Owen et al., 2004).

Conclusion

Communities in states with high rates of obesity benefit from studies, such as the current study, that focus on finding ways to prevent or treat obesity through structuring the residential built environment to promote enjoyable, daily exercise. This study is especially relevant because it took place in Iowa, one of the seven states in the U.S. with the highest rates of adult obesity.

High rates of overweight and obesity in adults in the U.S. and associated chronic disease and high health care costs which increase with age is a primary concern for individuals and their communities. Research indicates excessive weight gain leading to overweight, obesity, and chronic disease generally occurs after years of consuming a poor-quality diet and living a sedentary lifestyle. The cumulative negative effects of life-long poor eating habits and little regular exercise intensify as people reach age fifty and costly chronic disease begins to manifest. Implications for communities are 1) the projected population trends indicate the percent of people over age fifty will continue to increase every year, and 2) therefore there will be an increasingly greater percent of community residents and workers in the workforce over fifty years of age, resulting in higher health care and insurance costs for individuals and increasingly higher insurance costs for local employers.

Results of the current study indicate more survey respondents from the neighborhood with sidewalks were likely to engage in exercise than residents of the neighborhood without sidewalks, and far more of the survey respondents from the neighborhood with sidewalks choose walking as their favorite exercise than from the neighborhood without sidewalks. Because a favorite exercise is likely to become part of a continued lifelong exercise routine, the presence of accessible sidewalks for walking in residential neighborhoods may play a significant role in combatting overweight and obesity.

The research question that drove the study was *How can community development initiatives promote rural, residential built environments that help combat obesity?* An answer is for informed community members to use their collective voice and influence to promote community land use, development, and zoning policies that support walkable communities, and require residential neighborhood sidewalks as part of subdivision approval in new housing construction in all small, rural communities.

Future research could build on the results of my research and investigate links between adult physical activity/exercise and early childhood residency in neighborhoods with sidewalks in rural communities. The purpose of the future research would be to determine whether very early life experiences with residential sidewalks (first as an infant in a stroller, and then riding on a toddler trike, then a skateboard) is associated with lifelong interest in physical activity/exercise and good health. Future research might benefit from the use of GIS software to analyze location data and uncover any extraneous, confounding variables that might intervene between variables that affect environmental walkability.

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APPENDIX A. INSTITUTIONAL REVIEW BOARD EXEMPTION

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4366
FAX 515 294-4267

Date: 2/18/2016

To: Linda Johanson
PO Box 52
Forest City, IA 50436

CC: Dr. Jane Rongerude
146 College of Design
Dr. Cornelia Flora
317 East Hall

From: Office for Responsible Research

Title: Investigating the relationship between built environment infrastructure (sidewalks) and community physical activity and health in a small town in rural Iowa

IRB ID: 16-077

Study Review Date: 2/17/2016

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
 - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
 - Any disclosure of the human subjects' responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

You do not need to submit an application for annual continuing review.

You must carry out the research as described in the IRB application. Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

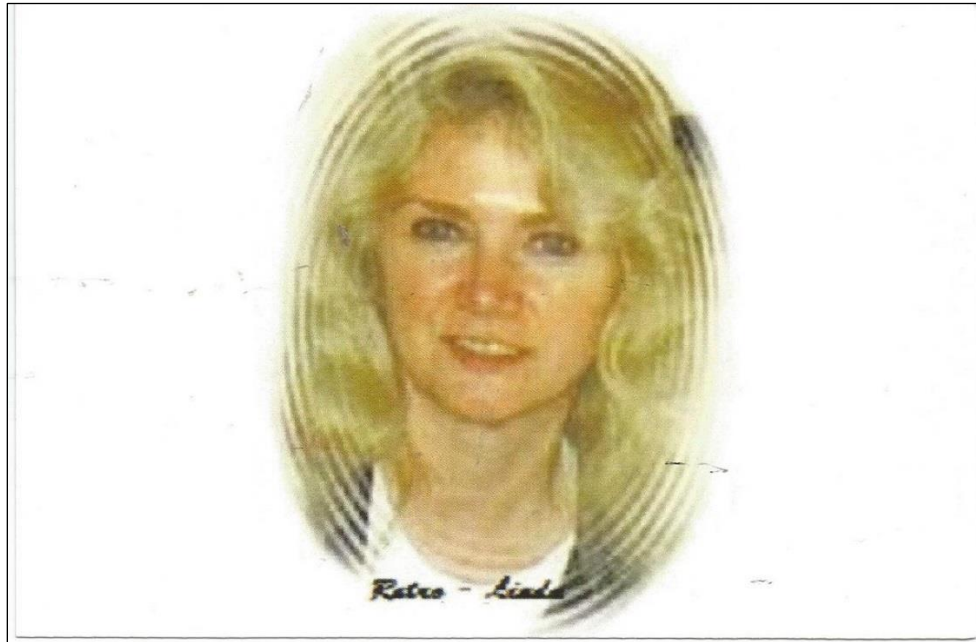
Please note that you must submit all research involving human participants for review. **Only the IRB or designees may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

Please be aware that **approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **An IRB determination of exemption in no way implies or guarantees that permission from these other entities will be granted.**

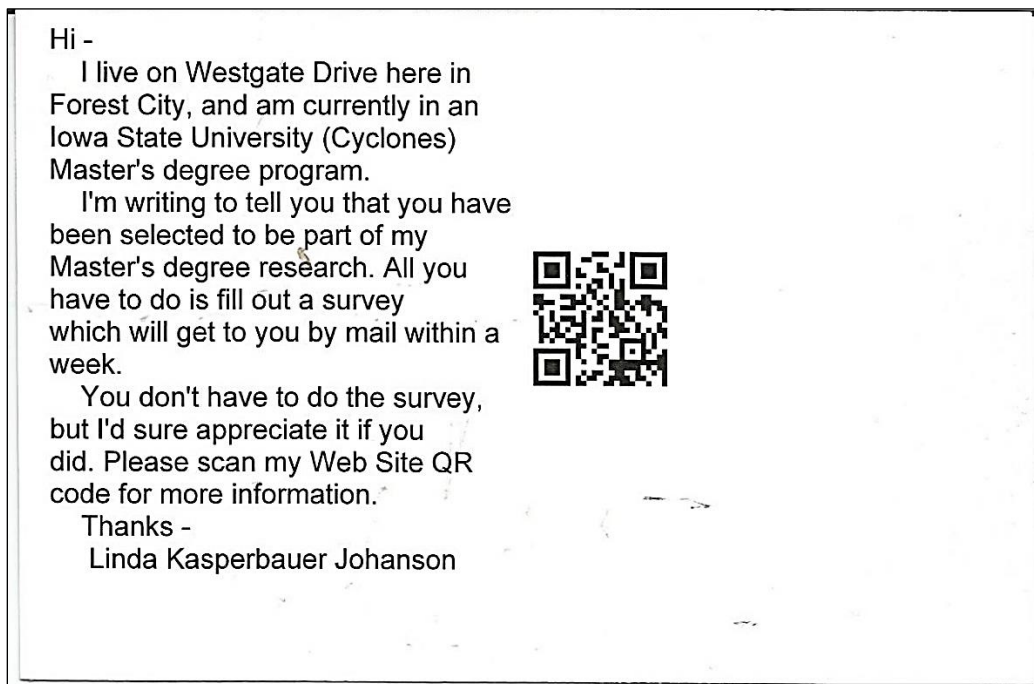
Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.

APPENDIX B. INITIAL POST CARD

Post Card: Front



Post Card: Back



APPENDIX C. LETTER OF INTRODUCTION

Linda Johanson



PO Box 52

Forest City, Iowa 50436

E-mail: lindakjo@iastate.edu or lindakjo@AOL.comWeb Site: <http://www.public.iastate.edu/~lindakjo/HomePage2.html>OR <http://qrs.ly/q750t30>

March 19, 2016

Hi –

My name is Linda Johanson, and I live on Westgate Drive here in Forest City. I'm currently in an Iowa State University (Cyclones), Master's Degree online college program in Community Development. I plan to receive my Master's Degree in December, 2016.

I'm contacting you to tell you that you have been chosen to take part in my Master's Thesis research study! All you have to do is fill out the enclosed short survey.

The following small print is the disclosure information required for an Iowa State University research project.

Title of the Study:

The official title of my research study is "Investigating the relationship between built environment infrastructure (sidewalks) and community physical activity and health in a small town in rural Iowa."

Purpose of the Study:

The purpose of the study is to help learn what influences people's behavior regarding diet and exercise. Specifically, does the presence or absence of sidewalks in neighborhoods influence how healthy you are, and how much exercise you get.

You are being asked to be part of my study because you live in either voter precinct ward 2 or ward 3 in Forest City. In Forest City, there are 4 voter precinct/wards. Neighborhoods in voter precinct wards 1, 2 and 4 have sidewalks. However, ward 3, which have many homes that were built in the 1970s, has very few sidewalks.

Procedure (what you do):

All you have to do is fill out the enclosed survey, designed to take 5 to 10 minutes. The survey has 7 questions regarding your health, diet, and exercise, and 3 general information questions. Simply skip any questions you don't want to answer.

Confidentiality:

Research studies are meant to include only people who choose to take part – it's totally voluntary. The actual returned survey will be completely anonymous. Your name and address were obtained from the voter precinct lists located in the Auditor's Office in the Winnebago County Courthouse, in Forest City, Iowa. It's the same list the politicians use.

Although this letter has your address on the envelope, the only identifier on the survey itself is Voter Precinct Ward 2 or Ward 3 on the top of the survey. The envelope you return your survey in has only my name (Linda Johanson) and my address on it. Therefore, it would be impossible to trace a returned survey to the person who sent it,

or even who returned a survey.

Risks, Costs, and Compensation:

Basically, there are no risks to this study, no costs to you, and no compensation – you're not getting paid to participate or fill out the survey.

Benefits:

There are no direct benefits to you, however it is hoped that the information gained from this study will benefit Forest City and other communities. **Results of the study might help determine if new housing developments should have sidewalks or not.** Therefore, I believe you would enjoy being part of this research study, and **part of a process that might change how neighborhoods will be designed in the future.**

That's all that's to it!

I sent my research survey to 438 randomly selected people living in ward 2 (with sidewalks) and ward 3 (without sidewalks). The purpose of the survey is to attempt to determine if there is a correlation between good health practices and having sidewalks in your neighborhood.

I would greatly appreciate it if you filled out and returned the enclosed questionnaire-survey. Keep in mind the questionnaire-survey is completely anonymous. The only identifier on the survey is voter precinct ward 2 or voter precinct ward 3 at the top of the survey. Your name isn't on the survey or the return envelope, so you can feel free to be totally honest. Skip any questions you don't want to answer.

Please take a few minutes to fill in the questionnaire-survey, put it in the enclosed, stamped, return envelope which is addressed to me-Linda Johanson, seal it, and send it.

I'd really appreciate it.

I'll post the results of the survey on my web site as soon as I get the completed surveys back, total the answers, and do the statistical analysis of the survey data.

My web site address is listed on the letterhead. You can also use my web site's QR code (below, to the right) to get to the web site. If my web site doesn't show a March 17, 2016 or later homepage update, just "refresh" the Web page on your phone or tablet.

Thanks.

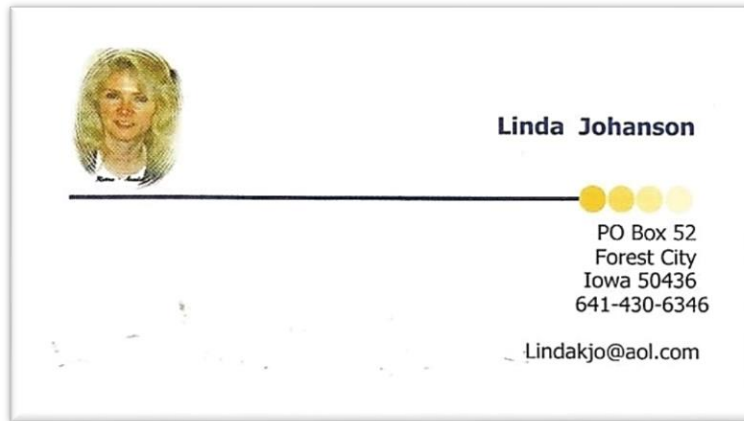
Sincerely,

Linda Johanson



APPENDIX D. CONTACT INFORMATION

Contact card – front



Contact card – back



APPENDIX E. SURVEY WARD 2

INSTRUCTIONS: This is a quick survey, with only 7 questions. It's an anonymous survey, which means your name is not on the survey, so you can be honest ☺

Please do the survey in 5 to 10 minutes, or less, sometimes quick answers are the most accurate!

For each question, please put a "√" or "X", in the box for the answer that applies to you.

HEALTH

1. How is your health?

- ☐ Excellent health
- ☐ Good health – for my age
- ☐ Average – for my age
- ☐ Poor health
- ☐ Very Poor health

2. FOOD CHOICES: in a typical week, how many times each week do you eat the following?

Indicate your answer to each question with a "√" or "X" in the box under the correct response.

Type of food you eat:	never	Not too often	Several times a week	Every day
Vitamins or supplements (any kind) →				
Fresh fruits and vegetables OR Frozen-fresh (bags of frozen veggies, strawberries, etc.) →				
Protein – meat, fish, eggs, beans, cheese →				
Whole grain bread or whole grain cereal →				
Store-bought TV dinners (frozen dinners) →				
Canned vegetables (store-bought -tin cans) →				
Junk food (Hostess cupcakes, chips, sugar coated cereal, etc.) →				

EXERCISE

3. Which is your favorite exercise; even if it's not the one you do the most? Please pick one.

- ☐ Walking (includes walking-for-exercise, walking to work, walking to class, walking uptown, or on a treadmill.)
 - ☐ Running or Jogging (outdoors, OR on a treadmill)
 - ☐ Lift weights
 - ☐ Bike (outdoors or stationary bike)
 - ☐ YMCA or Parks & Rec: organized sports, fitness classes of any kind
 - ☐ Pilates or Yoga
 - ☐ **NOTHING!** I don't exercise (If this is your answer, skip to question 7)

4. OK, now which exercise do you actually do most often? (It might not be your favorite exercise) Pick one.

- ☐ Walking (includes walking-for-exercise, walking to work, walking to class, walking uptown, or on a treadmill)
- ☐ Running or Jogging (outdoors or on a treadmill)
- ☐ Lift weights
- ☐ Bike (outdoors or stationary bike)
- ☐ YMCA or Park & Rec: organized sports, fitness classes of any kind
- ☐ Pilates or Yoga

5. If you exercise, how many times do you exercise in a typical week? (Any exercise – walking, sports, etc.)

- ☐ 1 or 2 days each week
- ☐ 3 or 4 days each week
- ☐ 5 or more days each week

6. When you exercise, how much time do you usually exercise? (Any exercise – walking, sports, etc.)

- ☐ Less than 15 minutes
- ☐ 15 to 60 minutes
- ☐ 60 minutes (1 hour) or more

7. If you don't exercise, of if you skip a day, what is your reason?

- ☐ No sidewalks to use for walking, jogging, or biking where I live
- ☐ Lack of time
- ☐ Not interested in exercising
- ☐ Can't afford YMCA or any health club dues and/or can't afford equipment

Now, some GENERAL INFORMATION - you don't have to answer these, but I think you will after you read the following. This information will be used to calculate who eats the most veggies, junk food, and so on, and who does the most exercise. Is it men or women, which age group and which income group?

PLEASE NOTE – this survey is anonymous – your name is nowhere on the questionnaire-survey or return envelope - so you can give your honest household income and honest age group 😊

Are you Male or Female?

- ☐ Female
- ☐ Male

What is your age?

- ☐ 18 to 29 years old
- ☐ 30 to 49 years old
- ☐ 50 to 70 years old
- ☐ Over 70 years old

What is your total household income?

- ☐ Less than \$40,000
- ☐ \$41,000 to \$80,000
- ☐ \$81,000 to \$120,000
- ☐ Over \$120,000

That's it - this is the end of the Survey.

Thank you for doing the survey! Remember to mail it 😊

When everyone's answers are in, I'll compile the answers and post them on my web site.

Thanks again, I really appreciate you taking the time to do my survey – Linda Johanson



APPENDIX F. SURVEY WARD 3

INSTRUCTIONS: This is a quick survey, with only 7 questions. It's an anonymous survey, which means your name is not on the survey, so you can be honest ☺

Please do the survey in 5 to 10 minutes, or less, sometimes quick answers are the most accurate!

For each question, please put a "√" or "X", in the box for the answer that applies to you.

HEALTH

1. How is your health?

- ☐ Excellent health
- ☐ Good health – for my age
- ☐ Average – for my age
- ☐ Poor health
- ☐ Very Poor health

2. FOOD CHOICES: in a typical week, how many times each week do you eat the following?

Indicate your answer to each question with a "√" or "X" in the box under the correct response.

Type of food you eat:	never	Not too often	Several times a week	Every day
Vitamins or supplements (any kind) →				
Fresh fruits and vegetables OR Frozen-fresh (bags of frozen veggies, strawberries, etc.) →				
Protein – meat, fish, eggs, beans, cheese →				
Whole grain bread or whole grain cereal →				
Store-bought TV dinners (frozen dinners) →				
Canned vegetables (store-bought -tin cans) →				
Junk food (Hostess cupcakes, chips, sugar coated cereal, etc.) →				

EXERCISE

3. Which is **your favorite** exercise; even if it's not the one you do the most? **Please pick one.**

- ☐ Walking (includes walking-for-exercise, walking to work, walking to class, walking uptown, or on a treadmill.)
- ☐ Running or Jogging (outdoors, OR on a treadmill)
- ☐ Lift weights
- ☐ Bike (outdoors or stationary bike)
- ☐ YMCA or Parks & Rec: organized sports, fitness classes of any kind
- ☐ Pilates or Yoga
- ☐ **NOTHING!** I don't exercise (If this is your answer, skip to question 7)

4. OK, now **which exercise do you actually do most often?** (It might not be your favorite exercise) **Pick one.**

- ☐ Walking (includes walking-for-exercise, walking to work, walking to class, walking uptown, or on a treadmill)
- ☐ Running or Jogging (outdoors or on a treadmill)
- ☐ Lift weights
- ☐ Bike (outdoors or stationary bike)
- ☐ YMCA or Park & Rec: organized sports, fitness classes of any kind
- ☐ Pilates or Yoga

5. If you exercise, how many times do you exercise in a typical week? (Any exercise – walking, sports, etc.)

- ☐ 1 or 2 days each week
- ☐ 3 or 4 days each week
- ☐ 5 or more days each week

6. When you exercise, how much time do you usually exercise? (Any exercise – walking, sports, etc.)

- ☐ Less than 15 minutes
- ☐ 15 to 60 minutes
- ☐ 60 minutes (1 hour) or more

7. If you don't exercise, of if you skip a day, what is your reason?

- ☐ No sidewalks to use for walking, jogging, or biking where I live
- ☐ Lack of time
- ☐ Not interested in exercising
- ☐ Can't afford YMCA or any health club dues and/or can't afford equipment

Now, some GENERAL INFORMATION - you don't have to answer these, but I think you will after you read the following. This information will be used to calculate who eats the most veggies, junk food, and so on, and who does the most exercise. Is it men or women, which age group and which income group?

PLEASE NOTE – this survey is anonymous – your name is nowhere on the questionnaire-survey or return envelope - so you can give your honest household income and honest age group 😊

Are you Male or Female?

- ☐ Female
- ☐ Male

What is your age?

- ☐ 18 to 29 years old
- ☐ 30 to 49 years old
- ☐ 50 to 70 years old
- ☐ Over 70 years old

What is your total household income?

- ☐ Less than \$40,000
- ☐ \$41,000 to \$80,000
- ☐ \$81,000 to \$120,000
- ☐ Over \$120,000

That's it - this is the end of the Survey.

Thank you for doing the survey! Remember to mail it 😊

When everyone's answers are in, I'll compile the answers and post them on my web site.

Thanks again, I really appreciate you taking the time to do my survey – Linda Johanson

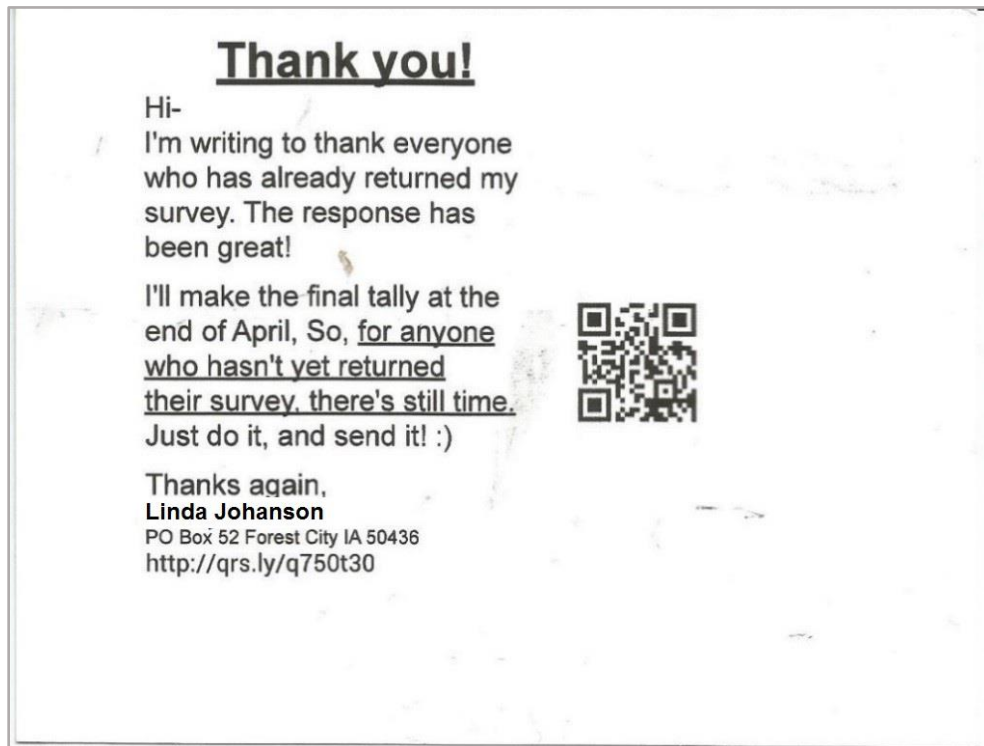


APPENDIX G. FOLLOW-UP POST CARD

Follow-up post card: front



Follow-up post card: back



APPENDIX H. CODING GUIDE

INSTRUCTIONS: This is a quick survey, with only 7 questions. It's an anonymous survey, which means your name is not on the survey, so you can be honest ☺ Please do the survey in 5 to 10 minutes, or less. Sometimes quick answers are the most accurate! For each question, please put a "√" or "X", in the box for the answer that applies to you.

2 Ward 2 (sidewalks) **(NOMINAL)**

3 Ward 3 (no sidewalks)

(ORDINAL) HEALTH

1. How is your health?

- ☐ 5 Excellent health
- ☐ 4 Good health – for my age
- ☐ 3 Average – for my age
- ☐ 2 Poor health
- ☐ 1 Very Poor health

Similar to: How do you perceive your health?

Very Poor-|-----|-----|-----|-----| Excellent

(ORDINAL) FOOD CHOICES:

2. in a typical week, how many times each week do you eat the following?

Indicate your answer to each question with a "√" or "X" in the box under the correct response.

Type of food you eat:	never	Not too often	Several times a week	Every day
Vitamins or supplements (any kind)	1	2	3	4
Fresh fruits and vegetables OR Frozen-fresh (bags of frozen veggies, strawberries, etc.)				
Protein – meat, fish, eggs, beans, cheese				
Whole grain bread or whole grain cereal				
Store-bought TV dinners (frozen dinners)	4	3	2	1
Canned vegetables (store-bought -tin cans)				
Junk food (Hostess cupcakes, chips, sugar coated cereal, etc.)				

->Unhealthy foods, the bottom 3 above, were reverse coded. Foods responses were then combined into 1 score/variable, Healthy Choices, with a lower to higher ranking, higher = healthier

EXERCISE (both Q3 & Q4 - NOMINAL)

3. Which is your favorite exercise; even if it's not the one you do the most? Please pick one.

- ☐ 1 Walking (includes walking-for-exercise, walking to work, walking to class, walking uptown, or on a treadmill.)
- ☐ 2 Running or Jogging (outdoors, OR on a treadmill)
- ☐ 3 Lift weights
- ☐ 4 Bike (outdoors or stationary bike)
- ☐ 5 YMCA or Parks & Rec: organized sports, fitness classes of any kind
- ☐ 6 Pilates or Yoga
- ☐ 7 **NOTHING!** I don't exercise (If this is your answer, skip to question 7)

4. OK, now which exercise do you actually do most often? (It might not be your favorite exercise) Pick one.

- ☐ 1 Walking (includes walking-for-exercise, walking to work, walking to class, walking uptown, or on a treadmill)
- ☐ 2 Running or Jogging (outdoors or on a treadmill)
- ☐ 3 Lift weights
- ☐ 4 Bike (outdoors or stationary bike)
- ☐ 5 YMCA or Park & Rec: organized sports, fitness classes of any kind
- ☐ 6 Pilates or Yoga

5. **(ORDINAL)** If you exercise, how many times do you exercise in a typical week? (Any exercise – walking, sports, etc.)

- ☐ 1 1 or 2 days each week
- ☐ 2 3 or 4 days each week
- ☐ 3 5 or more days each week

6. **(ORDINAL)** When you exercise, how much time do you usually exercise? (Any exercise – walking, sports, etc.)

- ☐ 1 Less than 15 minutes
- ☐ 2 15 to 60 minutes
- ☐ 3 60 minutes (1 hour) or more

7. **(NOMINAL)** If you don't exercise, or if you skip a day, what is your reason?

- ☐ 1 No sidewalks to use for walking, jogging, or biking where I live
- ☐ 2 Lack of time
- ☐ 3 Not interested in exercising
- ☐ 4 Can't afford YMCA or any health club dues and/or can't afford equipment

Now, some **GENERAL INFORMATION** - you don't have to answer these, but I think you will after you read the following. This information will be used to calculate who eats the most veggies, junk food, and so on, and who does the most exercise. Is it men or women, which age group and which income group?

PLEASE NOTE – this survey is anonymous – your name is nowhere on the questionnaire-survey or return envelope - so you can give your honest household income and honest age group ☺

(NOMINAL) Are you Male or Female?

- ☐ 1 Female
- ☐ 2 Male

(ORDINAL) What is your age?

- ☐ 1 18 to 29 years old
- ☐ 2 30 to 49 years old
- ☐ 3 50 to 70 years old
- ☐ 4 Over 70 years old

(ORDINAL) What is your total household income?

- ☐ 1 Less than \$40,000
- ☐ 2 \$40,000 to \$80,000
- ☐ 3 \$81,000 to \$120,000
- ☐ 4 Over \$120,000 (\$40,000 to \$120,000 is P.E.W. designated middle class)

That's it - this is the end of the Survey.

Thank you for doing the survey! Remember to mail it ☺

When everyone's answers are in, I'll compile the answers and post them on my web site.

Thanks again, I really appreciate you taking the time to do my survey - Linda Johanson



APPENDIX I. EXAMPLES OF SURVEY RESPONDENT NOTES

5. If you exercise, how many times do you exercise in a typical week? (Any exercise - walking, sports, etc.)

- ☐ 1 or 2 days each week
☒ 3 or 4 days each week
☐ 5 or more days each week

6. When you exercise, how much time do you usually exercise? (Any exercise - walking, sports, etc.)

- ☐ Less than 15 minutes
☒ 15 to 60 minutes
☐ 60 minutes (1 hour) or more

7. If you don't exercise, or if you skip a day, what is your reason?

- ☐ No sidewalks to use for walking, jogging, or biking where I live
☒ Lack of time
☐ Not interested in exercising
☐ Can't afford YMCA or any health club dues and/or can't afford equipment

Now, some GENERAL INFORMATION - you don't have to answer these, but I think you will after you read the following. This information will be used to calculate who eats the most veggies, junk food, and so on, and who does the most exercise. Is it men or women, which age group and which income group?

PLEASE NOTE - this survey is anonymous - your name is nowhere on the questionnaire-survey or return envelope - so you can give your honest household income and honest age group ☺

Are you Male or Female?

- ☒ Female
☐ Male

What is your age?

- ☐ 18 to 29 years old
☒ 30 to 49 years old
☐ 50 to 70 years old
☐ Over 70 years old

What is your total household income?

- ☐ Less than \$40,000
☒ \$41,000 to \$80,000
☐ \$81,000 to \$120,000
☐ Over \$120,000

If there are no sidewalks, people here usually walk in the street. I have always wished for a bike/walking path along O Street near the Catholic Church out to a long Spring Valley Road. Many people walk + bike along there. The shoulder is narrow + uneven, not safe. Both Waldorf + FC students run along that route. All of the other bike/walking trails are east of Hwy 69 but much of the FC population lives west of Hwy 69.

That's it - this is the end of the Survey. There definitely needs to be a sidewalk or bike path along O Street.

Thank you for doing the survey! Remember to mail it ☺
 When everyone's answers are in, I'll compile the answers and post them on my web site.

Thanks again, I really appreciate you taking the time to do my survey - Linda Johanson



The aquatic center do not have to walk/bike in the street - very dangerous especially during high Winnebago traffic times.

5. If you exercise, how many times do you exercise in a typical week? (Any exercise - walking, sports, etc.)

- ☒ 1 or 2 days each week
☐ 3 or 4 days each week
☐ 5 or more days each week

6. When you exercise, how much time do you usually exercise? (Any exercise - walking, sports, etc.)

- ☐ Less than 15 minutes
☐ 15 to 60 minutes
☒ 60 minutes (1 hour) or more

elliptical 30 min } 2x a week
 weight lifting 10-15 min } 2 hour block
 Yoga 45 min
 almost 2 mile walk around our neighborhood in the street sometimes.

7. If you don't exercise, or if you skip a day, what is your reason?

- ☐ No sidewalks to use for walking, jogging, or biking where I live
☒ Lack of time I could make the time if I chose.
☐ Not interested in exercising
☐ Can't afford YMCA or any health club dues and/or can't afford equipment

Now, some GENERAL INFORMATION - you don't have to answer these, but I think you will after you read the following. This information will be used to calculate who eats the most veggies, junk food, and so on, and who does the most exercise. Is it men or women, which age group and which income group?

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That's it - this is the end of the Survey.

Thank you for doing the survey! Remember to mail it ☺

When everyone's answers are in, I'll compile the answers and post them on my web site.

Thanks again, I really appreciate you taking the time to do my survey - Linda Johanson

the city used to paint a side walk line in the street but gave that up a number of years ago.

you don't ask if we use sidewalks when exercising
or if we use them to get to the Y or work. 137 ~~138~~

Questionnaire-Survey for Voter Precinct Ward 2

INSTRUCTIONS: This is a quick survey, with only 7 questions. It's an anonymous survey, which means your name is not on the survey, so you can be honest ☺

Please do the survey in 5 to 10 minutes, or less, Sometimes quick answers are the most accurate!

For each question, please put a "✓" or "X" in the box for the answer that applies to you.

HEALTH

1. How is your health?

- ☐ Excellent health
☐ Good health – for my age
☒ Average – for my age
☐ Poor health
☐ Very Poor health

2. FOOD CHOICES: in a typical week, how many times each week do you eat the following? Indicate your answer to each question with a "✓" or "X" in the box under the correct response.

Type of food you eat:	never	Not too often	Several times a week	Every day
Vitamins or supplements (any kind) →				✓
Fresh fruits and vegetables or frozen-fresh (bags of frozen veggies, strawberries, etc.) →				✓
Protein – meat, fish, eggs, beans, cheese →				✓
Whole grain bread or whole grain cereal →				✓
Store-bought TV dinners (frozen dinners) →		✓		
Canned vegetables (store-bought -tin cans) →		✓		
Junk food (Hostess cupcakes, chips, sugar coated cereal, etc.) →			✓	

EXERCISE

3. Which is your favorite exercise; even if it's not the one you do the most? Please pick one.

- ☐ Walking (includes walking-for-exercise, walking to work, walking to class, walking uptown, or on a treadmill.)
☐ Running or Jogging (outdoors, OR on a treadmill)
☐ Lift weights
☐ Bike (outdoors or stationary bike)
☐ YMCA or Parks & Rec: organized sports, fitness classes of any kind
☐ Pilates or Yoga
☐ NOTHING! I don't exercise (If this is your answer, skip to question 7)

4. OK, now which exercise do you actually do most often? (It might not be your favorite exercise) Pick one.

- ☒ Walking (includes walking-for-exercise, walking to work, walking to class, walking uptown, or on a treadmill)
☐ Running or Jogging (outdoors or on a treadmill)
☐ Lift weights
☐ Bike (outdoors or stationary bike)
☐ YMCA or Park & Rec: organized sports, fitness classes of any kind
☐ Pilates or Yoga

you also don't ask about family roles – there were places I couldn't walk to when my children were young since I didn't want them walking, biking, or in a stroller on the road. Good luck on your research. Go ISU !!

2006
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